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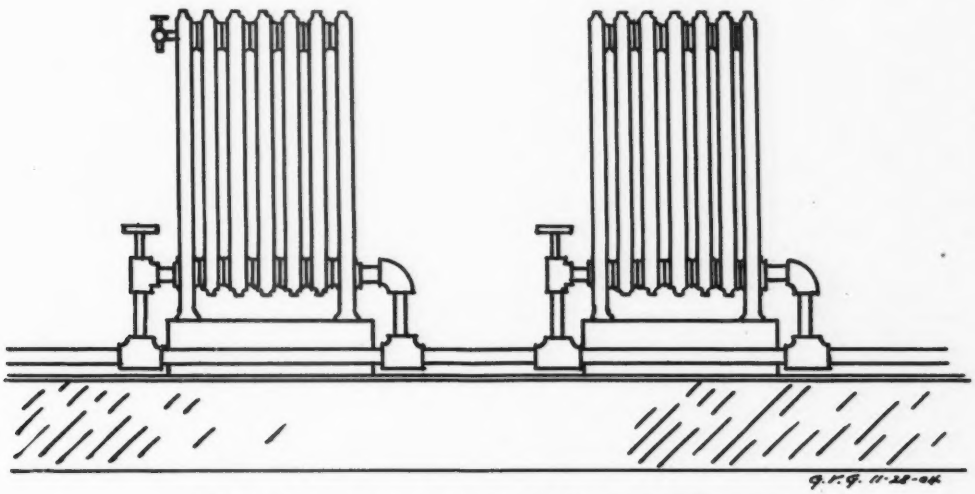
STEAM OR WATER RADIATORS BELOW WATER LINE?

BY ARTHUR T. RICHMOND

It often happens that rooms in the basement, on the same level as the boiler room, are required to be heated, and if the building is heated by steam special treatment is required for such rooms. A method sometimes employed in such cases is to use pipe coils or cast iron wall radiators above the water line—at least two or three feet above this line if possible. If a comparatively low temperature is required, or if not many people are to occupy the rooms, and these to be actively employed, this method is sufficiently good in many cases. On many accounts it is generally more desirable to have the radiating surface near the floor. The persons for whose benefit the heating apparatus is installed occupy the lower portion of the room, not the upper.

With the best arrangement of surface, with deflectors, etc., the upper part of the room, because of the tendency of warm air to rise, soon becomes several degrees warmer than the lower part, which is occupied by people. Moreover, the greater part of the heat given off is by means of direct radiation, the rays passing directly to the objects in the room, without warming the air in transit, so the nearer the radiating surface is to those objects the greater the efficiency of heating. The intensity of radiation of heat, as of sound, light, etc., decreases in proportion as the square of the distance increases. Therefore, it is better to have direct



STEAM OR WATER RADIATORS BELOW WATER LINE

radiating surface as near the floor as possible, even at some increase of cost. "Feet warm, head cool," is an old maxim applicable here, but the reverse is more likely to be the result with coils near the ceiling of the average room. In rooms with high ceilings, rotundas, skylights, etc., a coil at each skylight or peak is an advantage in counteracting the current of cold air that would otherwise descend and cause an unpleasant draft.

There are several methods of heating rooms on the same floor with the boiler, all using radiating surface near the floor, viz., utilizing the heat of the water of condensation by passing it through the required radiators on its way back to the boiler and parting with its heat in the same manner as in ordinary hot water heating; also, by the use of return steam traps to return the water of condensation from these radiators to the boiler, in which case they act as steam radiators; also, by letting the condensation go to waste through the ordinary steam trap. The second and third methods are in somewhat general use and we will consider some of the conditions in the use of the first.

Given, a church requiring 2,000 square feet of direct radiating surface and 800 square feet of indirect surface. Of this, 400 square feet of direct surface is for ladies' parlor, dining room, kitchen, toilets, etc., in the basement, on the same floor as the boiler, and we will utilize as much of the water of condensation as possible, passing it through hot water radiators below the water line. We can divert three-fourths of the return water through the radiators without greatly complicating the piping and will arrange the radiator branches on the one pipe hot water system so that each radiator may be independently controlled as in the sketch.

The connection supplying the radiator should be taken from the top of the main, so that the hottest water will tend to pass through the radiator, and the branch that returns the water to the main should enter at the side, preferably thorugh an eccentric tee, so that there may be the greatest possible difference in density and weight of the water between the two ends of the radiator.

Deducting the 400 square feet of direct surface in the basement, we have 1,600 square feet actual direct steam radiation. Three-fourths of the condensation from this can be utilized in the basement radiators. Each square foot of steam radiation will condense about three-tenths of a pound of steam per hour in a room at 70 degrees Fahrenheit, or 360 pounds in all. The 600 square feet of indirect surface will condense about .45 pounds per hour per square foot, or 270 pounds. Adding to the sum of these 15 per cent. for steam condensed by the piping, which is covered where possible, we have 724.5 pounds, say 725 pounds of water at a temperature, at the beginning of its passage, of say 210 degrees F., to pass per hour through the lower water radiating surface.

This was assumed above as 400 square feet of steam radiation, but as it is to be used for water circulation it will need increasing. At two pounds pressure, the usual basis for calculation with the room at 70 degrees and outside temperature at zero, cast iron steam radiation of a good pattern will emit about 298 B. T. U. per square foot per hour; 400 square feet would therefore give out 119,200 B. T. U. per hour.

Water at 210 degrees F. contains 178.87 B. T. U. above 32 degrees F., but as the temperature of the room is to be kept at 70 degrees F., we will deduct the heat of water at that temperature—38.02 B. T. U. Then 178.87 minus 38.02 equals 140.85. This multiplied by 725, the amount of water condensed per hour in the radiating surface under consideration gives us a total of 102,116.25 B. T. U. per hour which we may utilize by means of the radiators below the water line to heat the rooms in the basement.

But we need 119,200 B. T. U. and are therefore short by 17,083 B. T. U. which must be supplied by some other means, say steam coils or cast iron wall radiators above the water line. As steam radiators emit 298 B. T. U. per square foot per hour, we shall need 57.33 square feet to supply this deficiency, say eight or nine 7-foot sections of wall radiation.

Hot water radiators at 210 degrees will emit 270 B. T. U. per square foot per hour, and we need 378.2 square feet to transmit the heat at our dispisal, viz., 102,116.25 B. T. U. per hour.

To allow for the possibility of the water of condensation being sometimes lower in temperature, because of a smaller quantity of steam radiation in use, and a consequent decrease in amount of steam condensed, it will be necessary in each particular case to know the probable variation from a full use of all the steam radiators whose condensation passes through the water radiators. It is assumed that the Sunday-school room, as well as the auditorium, is heated entirely by steam radiators. It is frequently the case that heat is not wanted at the same time in both Sunday-school room and auditorium, while the rooms in the basement may all be used at the same time, with part or none of the steam radiation. In that case a separate supply connection, with valve, might be run from the boiler to the hot water radiators and the system be filled with water to a point sufficiently above the flow pipes to insure constant circulation, using this part of the system at such times as a simple hot water plant.

The automatic steam damper regulator chain should be unhooked at such times, as there would then be no variation in the pressure acting thereon. There should be an automatic expansion tank, with a valve for cutting out when used as a steam plant, installed at such a level as to insure a constant supply of water for circulation through all pipes supplying the hot water radiators and at the same time to be lower than the first floor radiators which are equipped with automatic air valves.

There are sometimes individual radiators on stairway landings or in vestibules at a level slightly lower than the main floor. The water circulation level may be allowed to rise in these if necessary, to any level below the air valve, or higher if a reliable air valve is used that will close against water as well as steam.

If it is intended to use the basement radiators under water circulation, when no steam radiators are in use, we shall need to provide a more liberal amount of radiating surface than that computed above for utilizing the water of condensation, for the reason that the initial temperature of the circulating water is most commonly found to be at about 180 degrees F. instead of 210 degrees as assumed above. With the radiators at 180 degrees and the room at 70 degrees the emission of heat is at the rate of about 199 B. T. U. per square feet per hour, or two-thirds that of steam at two pounds and 219 degrees, and we shall need 513.13 square feet to utilize the amount of heat at our disposal, viz., 102,116.25 B. T. U. per hour. This would be a safer proportion for condensation use than that mentioned above, 378.2 square feet, because of the probable frequent reduction in quantity and temperature of the water of condensation due to the cutting out of part of the system. This, however, will not obviate the necessity of installing the additional steam radiation, 57.33 square feet, to supply the heat lacking in the water of condensation.

With the amount of radiation under consideration an equivalent of 4,000 square feet of direct steam radiation, including an increase of 50 per cent. for indirect surface and 25 per cent. for piping, allowance for intermittent use being included in the amount of actual surface first mentioned, the boiler power should be divided into two units rather than being all in one, for there would be

many times when only a portion of the building would be in use and one of the smaller boilers would be sufficient for the purpose, easier to handle and more economical than if one large boiler sufficient for the whole system had to be fired up for each sociable, or prayer meeting or committee meeting. Another advantage of the two boilers in this case is at such times as the hot water radiation only is required to be in use. If the one large boiler were used for this purpose there would be a tendency to overheat the comparatively small quantity of water contained in this part of the system and there would be steaming and overflowing.

Without going into details of cost, which vary with each case, it appears probable that the extra first cost of the larger and more expensive radiators required for hot water circulation, with the expansion tank, special piping and valves for changing from steam to water, etc., would be as great as that of a return steam trap and connections, if not greater, to say nothing of the trouble and waste involved in filling and emptying the system for water circulation, and vice versa. I have however seen plants designed somewhat as above described, taking the supply for the basement radiators simply from an ordinary steam connection without utilizing more of the water of condensation than would occur in the short branch leading to each radiator.

In buildings where the whole plant is in continuous use, such as bowling alleys, basement stores, etc., and where the basement radiation is of proper amount to utilize the whole of the water of condensation, without the special piping, tank, etc., mentioned above, this method possesses several advantages as against overhead surfaces, as indicated earlier in this article.

DETAILS OF CONNECTIONS—II

By Chauncey Matlock

Fig. 5 shows the correct way to arrange a return-bend wall coil in a one-pipe installation. The steam connection is made in the usual way with an angle valve, but it will be seen that the return is connected into the steam riser through a check valve, located at least 12 inches below the bottom pipe of the coil.

The check valve is used instead of a hand valve to prevent reverse circulation of steam shutting off the air valve before the coil is hot, and it is located below the coil in order to secure a difference in pressure necessary for the proper circulation of steam in the coil.

The method of connecting the air line is apparent.

Fig. 6 suggests a method of dividing a large wall coil into two parallel coils at a very slight additional cost. Usually the coils are made of a different number of pipes, providing a means of very fine temperature regulation in mild weather. These coils are shown arranged on the two-pipe plan. The reasons for placing check valves in the return and locating them below the coil are the same as given under Fig. 5.

Fig. 7 shows a miter coil, with vertical spring piece, arranged on the ordinary two-pipe plan, but with a check valve in the return for the reasons given before.

It will be noted that the air valve, in this as well as in preceding figure, is kept well above the return header.

Fig. 8 shows a typical method of connecting a return pump in connection with an automatic governor. The steam piping is arranged in such a manner as to permit the operation of the pump either by hand or automatically through the governor.

It will be noted that the water line of the governor is well above the suction valves of the pump, a point very

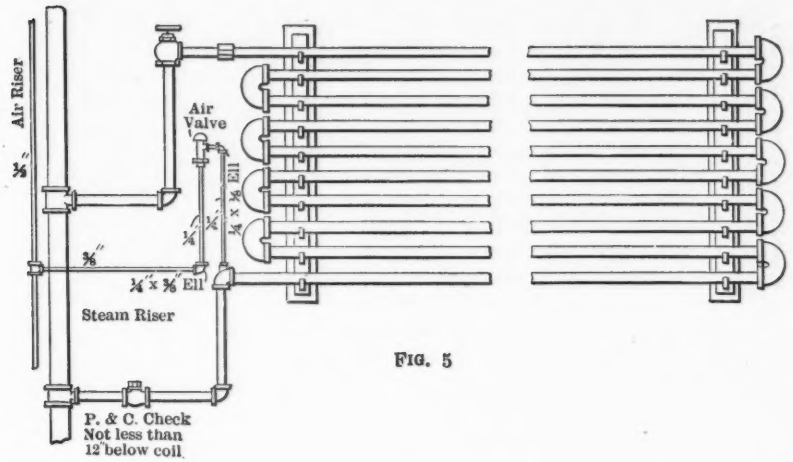


FIG. 5

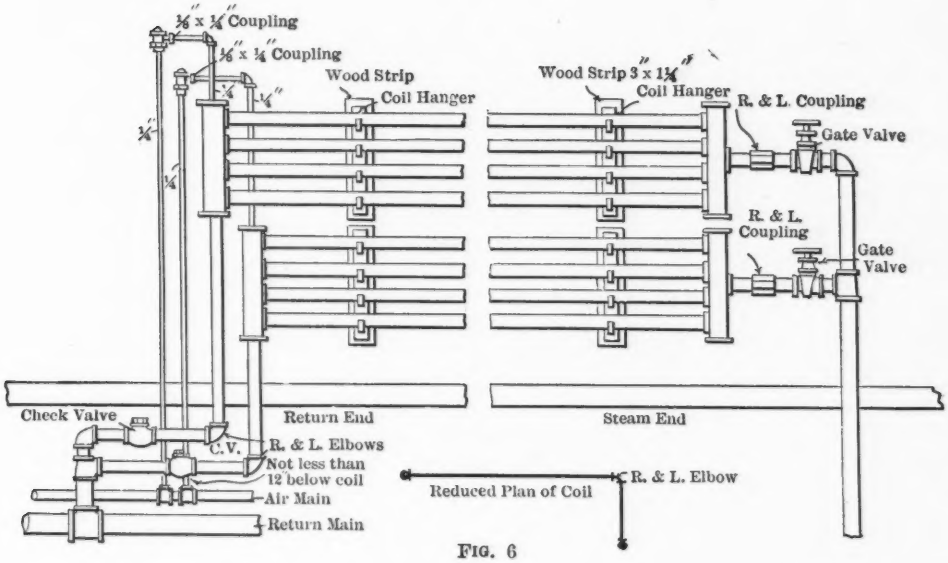


FIG. 6

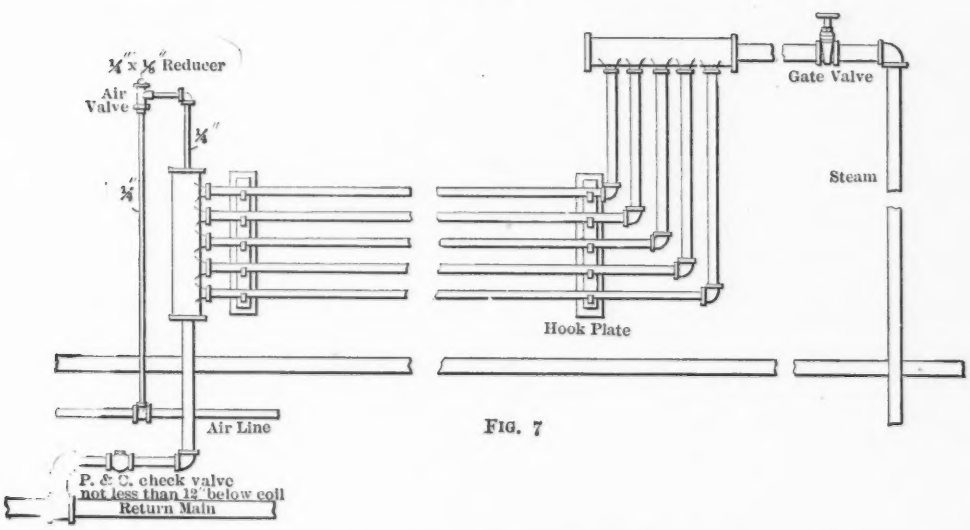
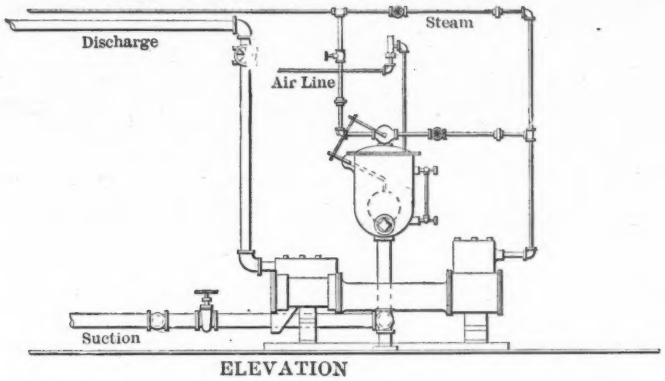
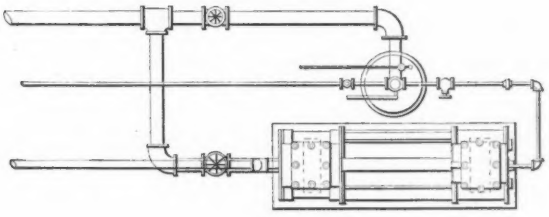


FIG. 7

DETAILS OF CONNECTIONS

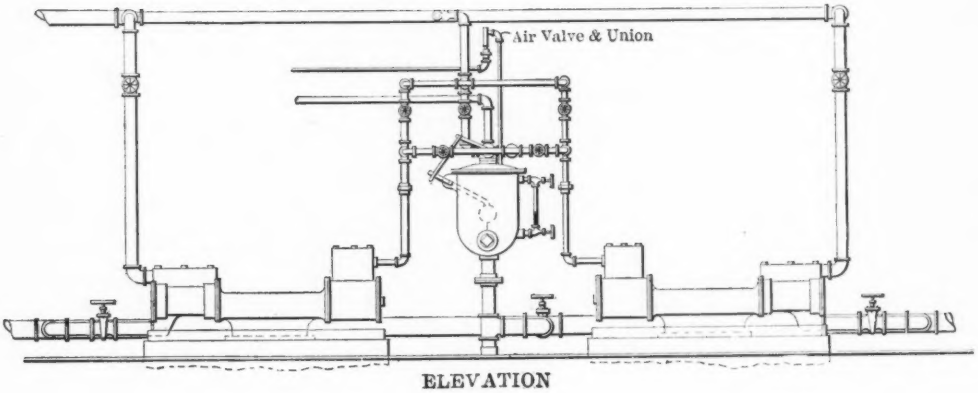


ELEVATION



PLAN

FIG. 8



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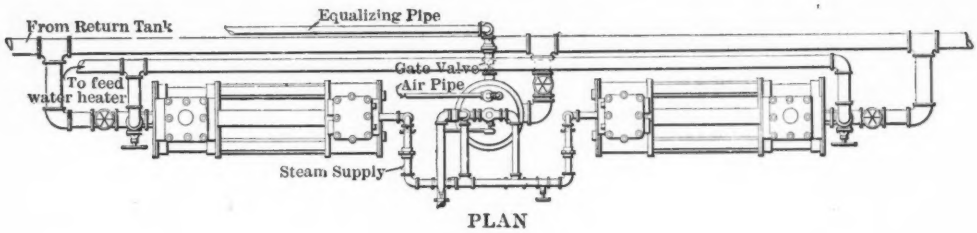


PLAN

FIG. 9

DETAILS OF CONNECTIONS

frequently overlooked. The piping is arranged for a case where it is not practicable to equalize from the governor to the supply main. It is, however, always best to equalize when possible. The usual air connection is shown.

Fig. 9 shows a typical method of connecting two return pumps operated by the one governor—the usual method in large installations.

It will be noted that the steam piping is arranged so as to permit the operation of either or both pumps by

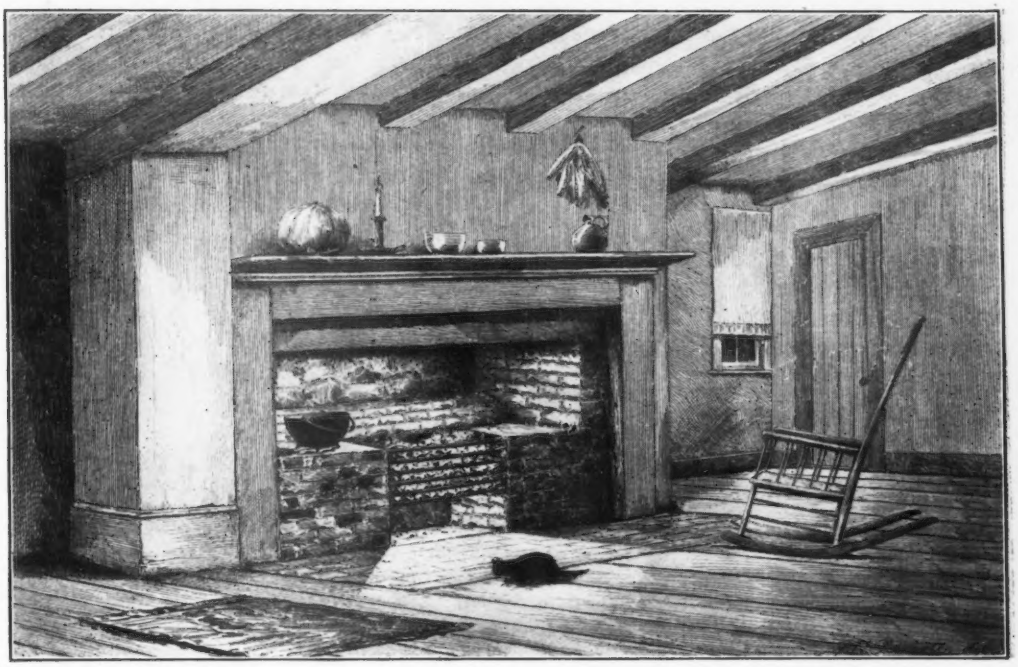
hand or automatically by the governor, or one pump each way.

The equalizing pipe shown is connected into the steam heating main, and is for the purpose of preventing any difference in pressure between the steam and return mains causing a false water level.

A connection is also provided to relieve the radiators of air.

THE "INVENTION" OF ANTHRACITE COAL

When we speak of the invention of anthracite coal, so far as it interests those in the heating business, we do not mean to indicate that any man has found a way to make anthracite coal, but all of our grandfathers and most of our fathers know the time when "stone coal" as a fuel was only available in connection with the forced draft of the blacksmith's forge.



THE INVENTION OF ANTHRACITE COAL—THE FIRST ANTHRACITE GRATE

It remained for an enterprising Quaker to develop the idea that anthracite coal, or "hard coal," or "stone coal," as it was commonly called, could be used in connection with a natural draft, and he started in the hardest possible way—in an open fireplace grate. It is even stated that his first grate was made of green hickory sticks on account of the cheapness of hickory and the great cost of iron at that time.

This, we may say, is doubted and the probabilities are that the hickory grate was simply a model from which a bar iron grate was constructed.

Jesse Fell, the inventor of this grate, was one of the oldest residents of Wilkes-Barre, Pa., where he made the original experiment. He purchased the property at the corner of Washington and Northampton streets in 1787, and resided there until his death in 1830. He was sheriff of Luzerne county for two terms and was lieutenant and afterwards brigade inspector in the militia. He was Associate Judge of Luzerne county from 1798 to his death.

Judge Fell, in conjunction with his nephew, Edward Fell, set up the iron

grate which he had invented in the fire-place of his house, February 11, 1808, and made his successful experiment of burning anthracite coal therein, as appears from the following entry made by the Judge on the fly leaf of a "Treatise of Masonry."

"February 11, 5808 of Masonry; made the experiment of burning the common stone coal of this valley in a grate in the common fire-place in my house, and find it to answer the purpose of fuel, making a clear and better fire at less cost than burning wood in the common way.

"JESSE FELL,

"Borough of Wilkes-Barre, February 11, 1808."

Judge Fell appears to have used anthracite coal in 1788 for making wrought nails, producing eminently satisfactory results and in 1808, at the time of his experiment, anthracite coal was in common use among blacksmiths, but when the Judge invited a number of his neighbors to his house on a cold evening in the fall they were astonished and delighted to find a bright, glowing fire of the anthracite of which their hills were full. Grates were in instant demand, and as fast as they could be constructed Wilkes-Barre and the surrounding townships were in the enjoyment of this unlooked-for luxury.

There is, as before mentioned, some controversy as to whether the original anthracite grate was constructed of green hickory or of bar iron. Of those who contest Mr. Fell's priority of discovery, some laid stress upon the unreasonableness of his building a grate of green hickory, assuming that the necessary kindling placed under the grate to ignite the coal would first destroy the grate. To this proposition there are two answers, one being that a man experienced in the matter of fires would not put his kindling under the grate but in it, and the other that the grate of green hickory was simply a model for the bar iron grate.

The Judge seems to have realized the necessity of some accelerated draft on first starting the fire and so arranged his grate as to provide this —something, no doubt, corresponding to what is called the "blower" of the modern fire-place.

In 1810 a German mineralogist, clad in a suit of leather, attended a session of the Pennsylvania Legislature to secure a charter for an anthracite mining company, and he seems to have recognized the power of the press by approaching the editor of the *Republican Argus* (in those days Republicans were what we now call Democrats—anything to beat a centralized government). The mineralogist gave the editor a wagon load of coal and the editor paid $50 for a semi-circular sheet iron stove and had it put up in his private office. He put in a lot of charcoal, but could not burn the stone-coal. He said that all it would do was to look red like stones in a well-heated lime kiln, and when at night the coals were taken out they were "to all appearances as large as when cast into the stove." He says, "whatever the cause, such was the result of the first attempt to burn Lehi coal in Philadelphia where since that time millions of tons of it have been welcomed and consumed."

The following is a letter from Judge Fell to his cousin, Jonathan Fell, describing his first experiment in burning coal for domestic use:

"Esteemed Cousin: When I saw thee last I promised to write to thee and give thee some data about the first discovery and use of stone-coal in our valley (I call it stone-coal because everybody knows what is meant by that name).

"The late Judge Gore, in his lifetime, informed me that he and his brother, the late Captain Daniel Gore (both being blacksmiths), were the first that discovered and used this coal in their blacksmith fires, and found it to answer their purpose well. This was before the Revolutionary war and, as near as I can collect information, about the year 1770 or 1771, and it has been in use ever since by the blacksmiths of this place.

"In the year 1778 I used it in nailery, and found it to be profitable

in that business. The nails made with it would neat the weight of the rods, and frequently a balance over. But it was the opinion of those who worked it in their furnaces, that it would not do for fuel, because when a small parcel was left on their fires and not blown it would go out. Notwithstanding this opinion prevailed, I had for some time entertained the idea that if a sufficient body was ignited it would burn. Accordingly in the month of February, 1808, I procured a grate made of small iron rods, ten inches in depth and ten inches in height, and set it up in my common room fireplace, and on first lighting it found it to burn excellently well. This was the first successful attempt to burn our stone-coal in a grate, so far as my knowledge extends. On its being put in operation, my neighbors flocked to see the novelty, but many would not believe the fact until convinced by ocular demonstration. Such was the effect of this pleasing discovery that in a few days there was a number of grates put in operation. This brought the stone-coal into popular notice. I need not mention the many uses to which it may be applied, as you who are in the coal concern have the means of knowing its value.

"I am thy affectionate cousin,

"JESSE FELL."

From all available evidence it seems clear that the use of anthracite coal without mechanical draft is due to the investigating genius of Judge Fell, who was an ancestor of Mr. B. H. Carpenter, a heating engineer of Wilkes-Barre, Pa., and a prominent member of the American Society of Heating and Ventilating Engineers, from whom the above data are received.

SOME NOVEL HOT WATER HEATING SYSTEMS

BY DR. ALFRED GRADENWITZ

III—THE "AUTO-DENSATOR" SYSTEM

A system designed by the firm of Bruun & Sörensen is called the "Auto-Densator" system. This comprises the same principal parts as an ordinary hot water system, namely, the boiler, the radiators, an expansion tank and finally the pipes conveying the hot water from the boiler to the radiators and the cooler water from the radiators back to the boiler.

In addition to the above parts, the auto-densator system (see Fig. 6) has an expansion tank, connected with the main return pipe; the regulation of the boiler is accomplished by a thermo-regulator (11) which is influenced by the water coming from the radiator, thus fixing not the maximum but the minimum temperature of the system. As a matter of fact the highest temperature of the system will always be almost constant, namely, 100 degrees C., or a few degrees above, as the system acts with steam in the rising pipe. By adjusting the regulator the amount of cooling of the radiator and accordingly the speed of flow of the water is fixed.

As seen in Figs. 6 and 7, the water is heated in the boiler and flows through the rising pipe, 2, and the expansion tank, 3, to the radiators and then through the pipe 6 to the expansion tank 8, and back to the boiler.

As long as the temperature of the water in the rising pipe does not reach 100 degrees C., the flow of water is affected by the lower specific gravity of the heated water, just as in the ordinary hot water system. As soon as the temperature of the water exceeds 100 degrees C., steam is generated in the rising pipe just where the pressure of the column of water is equal to the pressure of saturated steam corresponding to the temperature. The generated steam will rise and pump the water from the boiler into the expansion tank 3. Then the water will ascend in the tank 3 and be higher than the surface of the

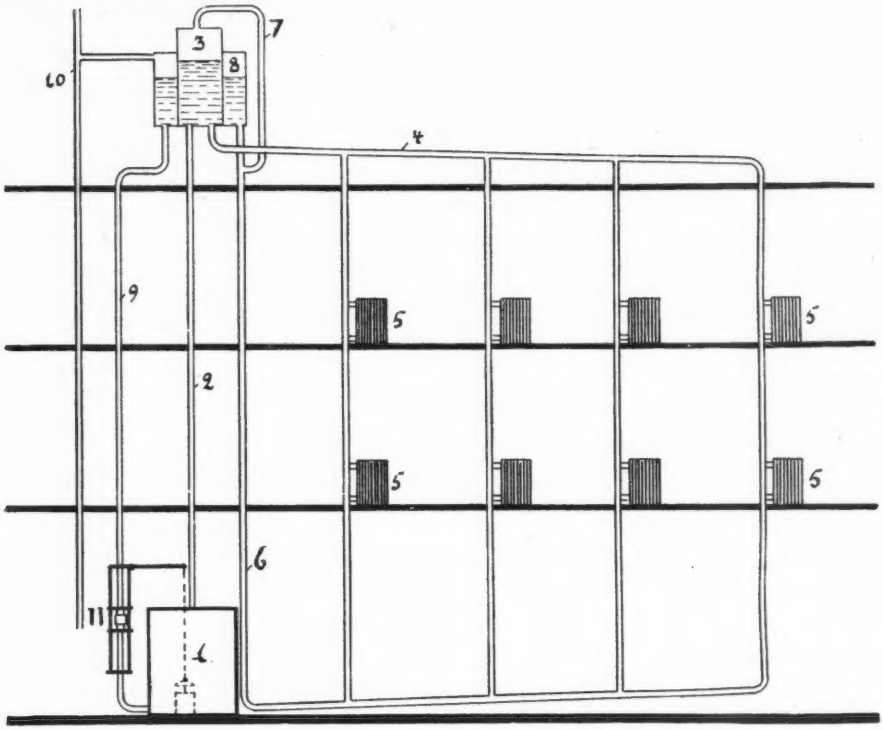


FIG. 6

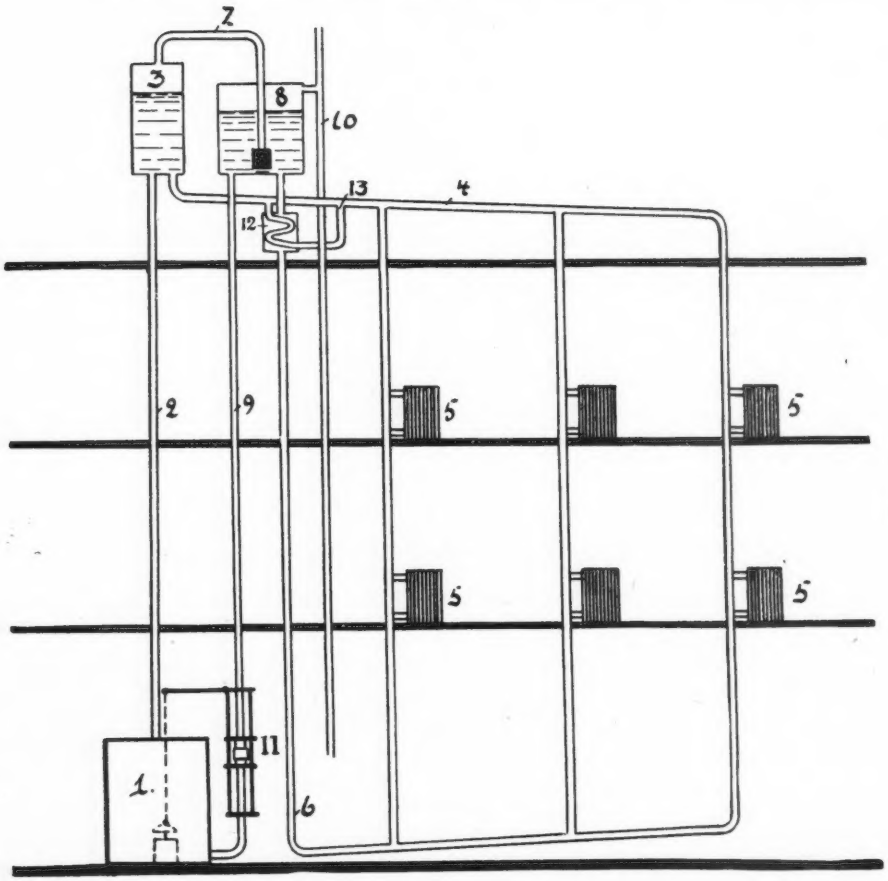


FIG. 7

SOME NOVEL HOT WATER HEATING SYSTEMS

water in the tank 8, thus giving rise to a continuous flow of water from the tank 3, through the radiators to the tank 8. As long as the generation of steam goes on in the rising pipe, the flow of the whole system will be accelerated. For the generation of steam to be continued, the steam coming to the expansion tank 3 must be condensed.

In Fig. 6 the expansion tanks are located one within the other so that the cooler water from the radiators passes round about tank 3, cooling this and consequently condensing some steam. Above the surface of the water in the tank there will still be accumulating some steam, which is conveyed down through the pipe 7 below the surface of the water in tank 3, to be condensed. Above the surface of the water in the tank 3, the pressure of steam can accordingly at most be corresponding to the immersion of the pipe 7, and to the friction of steam produced by the movement through the pipe 7.

In Fig. 7 the expansion tanks are placed separately, while condensation is brought about in the same way as in Fig. 6, by conveying down the steam into the water of the tank 8.

The characteristic feature of this system is accordingly the automatic condensation.

The circulation may obviously be accelerated by increasing the superheating of the boiler, provided the steam generated by the superheater can be condensed. As the condensation, according to the above, may be increased at will by means of the pipe 7, the speed of flow of the water may be highly augmented and the area of the pipes reduced to only 10 to 30 per cent. of those of the normal system.

In addition to the good points of the ordinary system, namely, durability, central regulation, ready control of every one of the radiators, as well as easy superintendence of the boiler and the water level, this system offers in fact the advantage of greater cheapness, of the safety of the small piping against leaking and the operation will be free from annoyances.

If, for the water running to the radiator, instead of a temperature of 100 degrees C. a temperature not exceeding 80 to 90 degrees should be required, this result as shown in Fig. 7 will be obtained by adding the receiver 12, where the return water cools the water running to the radiators. By adjusting the valve 13 the maximum temperature of admission of the water can be reduced to 90 degrees, and if the water in the radiator is cooled from 90 degrees to 65 degrees, the surface of the coiled pipe of the receiver 12 must be 1½ to 2 square meters for a plant having a total consumption of heat of 100,000 calories. The system thus allows of the same low temperature being obtained in the radiators as warranted by the usual systems. Being open, like the latter, the system is moreover free from danger and accordingly not subject to official inspection.

In addition to the heating of separate buildings, the system may be applied also to that of blocks of buildings.

WARM AIR HEATING OF A PUBLIC SCHOOL

Many heating engineers, familiar with all kinds of systems, believe that there are quite as many interesting problems in the construction of a properly working hot-air plant as will be found in connection with steam or hot water. It is doubtless true that steam can be forced to go almost anywhere—although frequently at some disadvantage; hot water, if properly coaxed, will go almost anywhere within certain limits. Hot air, however, in gravity systems, must always be coaxed, and even when the pressure of a fan is applied the air is exceedingly skittish and often goes where nobody ever wanted or intended it to go. It therefore constitutes a fine art to so design the ducts as to induce this coy element to travel over

the desired course in the desired volume and at the desired rate of speed.

The school herewith illustrated was originally sought to be heated and ventilated by a gravity hot air system, with four furnaces, located at the bases of four sets of vertical ducts leading to the rooms and two stack heaters at the base of the ventilating stack. (This stack is now used in connection with the present, modernized system, on account of its being part of the construction of the building and not readily changeable.)

This means of heating the stack was inadequate, and in the old system it was reinforced by placing at the base of the stack a hot water heater which had been installed for the purpose of supplying some radiators in the sanitary rooms; the radiation from the boiler was expected to give the necessary additional heat to create an upward current in the stack.

In spite of all that could be done, it frequently occurred, even in mild weather, that several classes had to be dismissed.

In the long run this plant became wholly unsatisfactory and the system which we describe was installed by the Fuller & Warren Co. It embodies four hot-air furnaces of the Fuller-Warren Company type; firepot 35 inches in diameter, with vertical sides, each furnace being placed in a separate chamber, allowing each to receive its full supply of cold air. The divisions separating the furnaces are carried up to a height of four feet, leaving a common heating, or plenum, chamber extending over all the furnaces. The ducts for conveying the heat to the various rooms open directly from this chamber of heated air.

To maintain a steady supply of air, a fan was provided. This is an ordinary ten blade, conical case, 60-inch, centrifugal fan (James Seymour, Jr., Newark, N. J.) operated by a 3 H. P. alternating motor (General Electric Co., Schenectady, N. Y.).

The sizes and capacities of the flues will at once indicate that this system is designed with a view to being used as a gravity system, for which reason there are provided sufficient by-passes to admit the necessary supply of air when the blower is not running. It will readily be seen that thus a great saving may be effected.

At the outset it was realized that the location of the warm air supply registers and of the ventilating registers was not of the best.

The most satisfactory results are to be obtained with the warm air registers located near the outside wall. and the foul air outlets near the inside corner, thus creating a natural circulation in the room by reason of the natural tendency of the hot air to rise and, as it cools to gradually fall, the inflow of further warm air taking its place.

In this case, the heating flues were of brick and formed a part of the construction of the building, so that it was impracticable to change them. They were modified by extending each flue in to the room by the use of a quarter cylinder of galvanized iron, covered at the top, and with the register placed at its opening so that the air would pass sideways along the wall instead of straight into the room. This galvanized iron extension did not interfere with the seating capacity and was painted to match the woodwork of the room. The operation of these extensions was very satisfactory.

The locations of the outlets were radically changed. Previously the air was taken down through registers in the floor, located almost anywhere it happened to be convenient, and the foul air drawn down from all the floors into the gathering chamber through ducts located on the basement ceiling, and thence into the main ventilating shaft.

This downward draft was obstructed by too much friction to permit satisfactory results.

Those registers were closed and openings were made in the side walls near the floor and near the inside corners of the rooms, and each foul air flue was carried individually up to

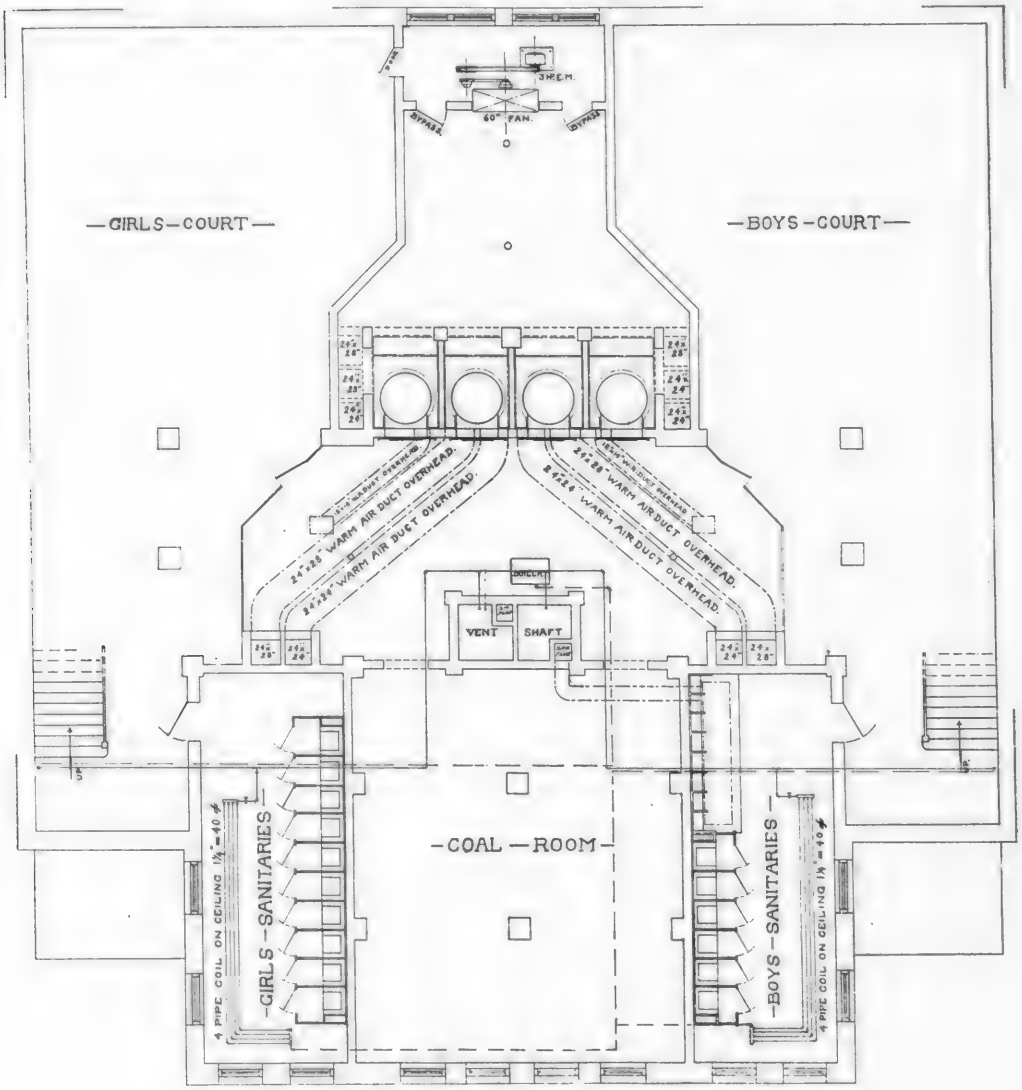
the attic, where all were connected by galvanized iron ducts into the main ventilating shaft and thence out of doors.

Anemometer tests, taken at various times in this building, demonstrated that the quantity of air distributed to the various rooms, and taken away by the exhaust, amount to 2,400 cubic feet per minute (which is of course a capacity of 60 per cent. more than required), and this without driving the apparatus to its utmost capacity.

To adjust this inflow and outflow of air, each warm air and vent opening is provided with an individual set of regulating dampers, set and adjusted at the time the test was made, which shows results of 30 feet of air per minute supplied for each occupant of the room, and a corresponding exhaust of vitiated air.

The temperature of the air throughout this building can be easily raised from 50 to 90 degrees in the short space of 20 minutes, each room maintaining an equal temperature—that is, no greater variation was noted in any room, irrespective of its location, than about one degree.

On the first floor there is a set of registers to be used for rotation of the air only—that is, instead of heating air from out of doors at all



WARM AIR HEATING OF A PUBLIC SCHOOL. FIG. 1

times, and in order to produce a fuel-saving device, the air is rotated within the building, the out-door air supply to the vent registers being closed and the rotation registers opened. This means a saving of anywhere from 30 to 40 per cent. of fuel.

The value of this is thoroughly demonstrated in the fact that, whereas, without this device, it was no uncommon thing for the janitor to come to the building, even in mild weather, and start up his apparatus about three or four o'clock in the morning; he now comes there only about 20 minutes before school opens and finds all his rooms uniform at about 68 degrees, with the purity of the air perfect.

In order to heat the building quickly, it is only necessary to leave the rotating dampers open ten minutes or so before school opens, and start the fans, and the temperature is raised quickly 20 or 30 degrees; then the rotating registers are closed, the vents opened, and the out-door supply drawn in. The result is a system which the engineer believes can not be duplicated in a steam system for two-thirds greater cost of installation, and yet saves fuel over the steam system.

The corridors are taken care of by two individual ducts from the common chamber, reinforced by two steam radiators near the entrance, on the first floor—40 square feet each.

The auxiliary steam boiler also takes care of the aspirating coils in the main ventilating stack, these coils being placed just above the openings from the rooms into the shafts. They are distributed in four sections—two pin radiators about a foot above the first floor openings and two above the second floor openings.

The sanitary rooms, which were found absolutely offensive, were torn out and new ones constructed in the rear of the building. These are warmed by 40-foot steam coils on the ceiling, and ventilated through galvanized iron ducts, running along the ceiling into a special vent flue in which is a 16-foot aspirating coil.

In order to have the air circulated in the rooms without uncomfortable drafts, the maximum speed of the fan is set at 400 revolutions, which can be reduced, by three steps, to 200 if desired. It is commonly run at about 333.

A frequent defect in hot air systems is the tendency, in days of high wind, to overheat one room, or one side of the building, at the expense of the other. This tendency has been met in this case by a thorough system of volume dampers, placed in each hot air duct, at a point near the heating chamber. These are readily operated by the janitor, and the capacity of each increased or decreased as the climatic condition demands. If, as is often done, an automatic system of control is applied, we have an ideal system; but that is something that is governed by the amount of money available. A number of schools have been fitted up on this plan, using the Powers regulating system, and the result is said to be admirable.

Another good feature of this system is the battery arrangement of the furnaces, with a common hot air gathering chamber. This makes it possible to run only as many furnaces as may be necessary to supply the requisite heat in all kinds of weather. Moreover, having a single firing place makes a great saving of labor in caring for the apparatus.

The cost of keeping in repair a system of this kind is an important consideration. The engineer of this system states that in some of his buildings that have been in operation for the last twelve years there is no record of a single instance where a dollar has been expended for repairs, excepting, of course, the grate bars, whose life depends largely upon the carefulness or carlessness of the janitor.

The noticeable features of this system are the battery system of blowers, the fan for supplying an absolute quantity of air when atmospheric conditions nullify the gravity system; the arrangement of supply and vent

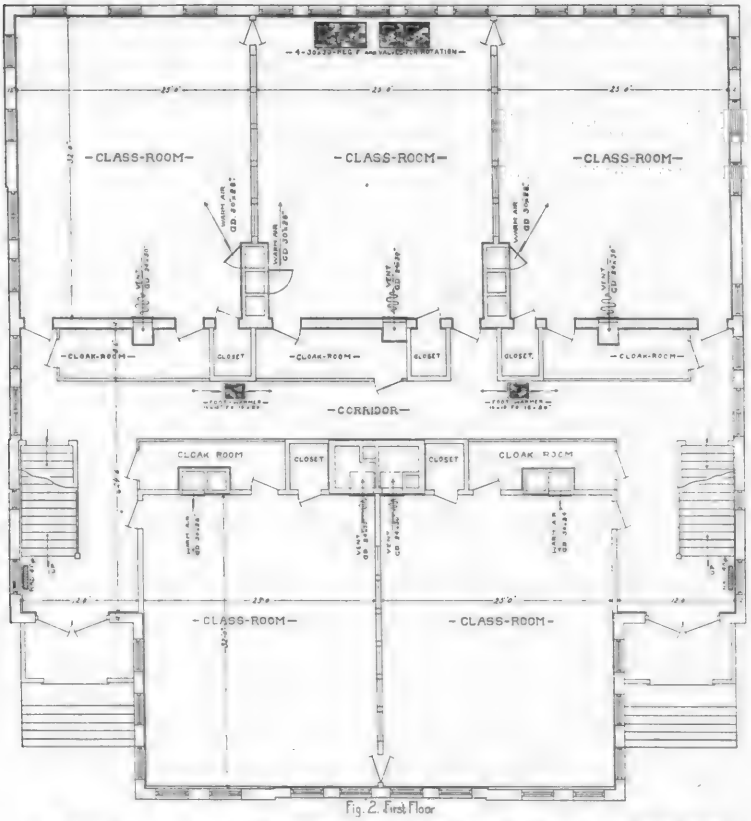


Fig. 2. First Floor

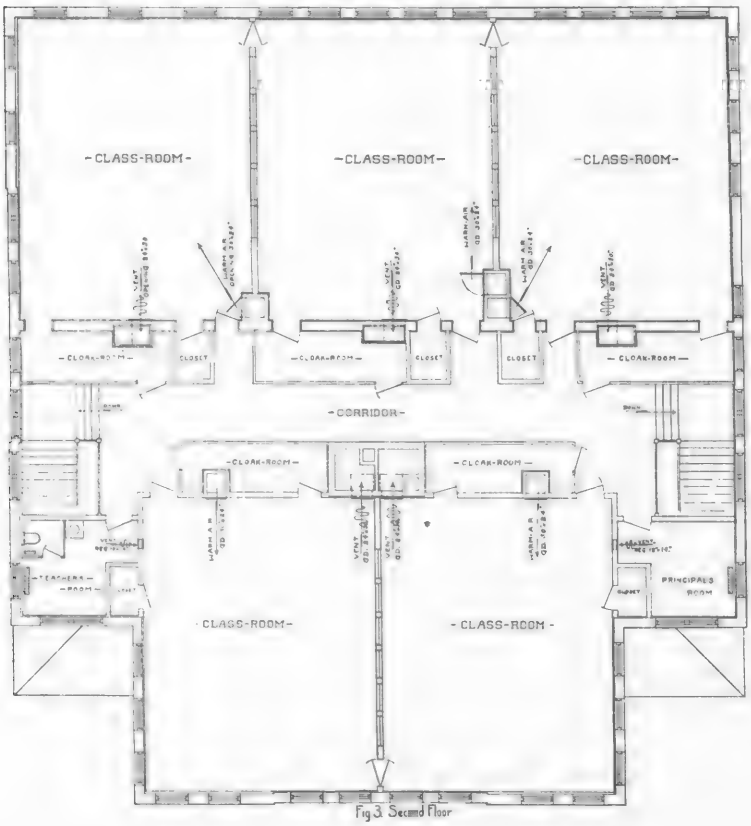


Fig 3. Second Floor

WARM AIR HEATING OF A PUBLIC SCHOOL. FIGS. 2 AND 3

registers in the rooms and the use of the auxiliary steam boiler for aspirating coils in the shafts and for supplying radiators in locations not easily taken care of by the furnaces.

The system described is not laid out exactly as it would have been done in a new building, but the results are said to be as nearly as possible perfect. In any case, it shows the principle involved in constructing a plant of this kind, and for that reason we believe it will be of interest to architects and engineers and the trade.

The Value of Technical Education

In America the money value of a good education has received close attention of recent years. Many people find fault with the administration of some of the American universities, which have been created through the generosity of American millionaires. But the average American citizen is shrewd enough to take advantage of the opportunities provided for him and the bare fact, stated in the reports of the Moseley Commission, that in America there are, at the present time, as many professors and lecturers on technical subjects at the universities as there are undergraduates on this side, is sufficient proof that the American father believes in a university training for his son more than the Englishman does. Some data compiled by the president of the American Society of Mechanical Engineers is worthy of notice. He showed that in engineering work the man who is unskilled reaches his maximum value as a wage earner at the early age of twenty-two, when he is worth about five hundred dollars per annum. If the man is trained in the shops he earns his maximum at the age of twenty-four, when he is worth about thirty per cent. more than his less fortunate and untrained brother. But the technical school graduate usually earns nearly four times as much as the unskilled man, although he does not commence earning his maximum until he is over thirty years of age. In order to confirm these figures, it should be mentioned that the Worcester Polytechnic Institute has compiled data concerning the salaries earned by their graduates, which shows that by investing a certain amount of money to defray the cost of his college training, and giving five years of his time, a graduate in engineering earns perhaps twice as much as one who does not attend a college.

It has been often stated that many of the successful men of the past generation were not technical graduates. But a glance at the careers of the managers of some of the largest engineering works in Great Britain will show that the majority of these men obtained tuition under such men as Professors Unwin and Kennedy. And again fifty, even twenty, years ago there was not the same keen competition as there is at present. About thirty years ago the temporary chief engineer of Portsmouth Dockyard was a man, certainly possessing a brilliant college record, but under thirty years of age. Such an event as that would now be impossible. The school of experience is one in which all engineers must graduate. They are the more fitted to obtain better experience and higher class work if they have had also, in their early manhood, an opportunity to graduate at a school of technology. For we are convinced that, however it may be obtained, technical education will pay those who are energetic enough to take advantage of facilities offered to them.—*Engineering Times —England.*

Greenhouse Heating Charts

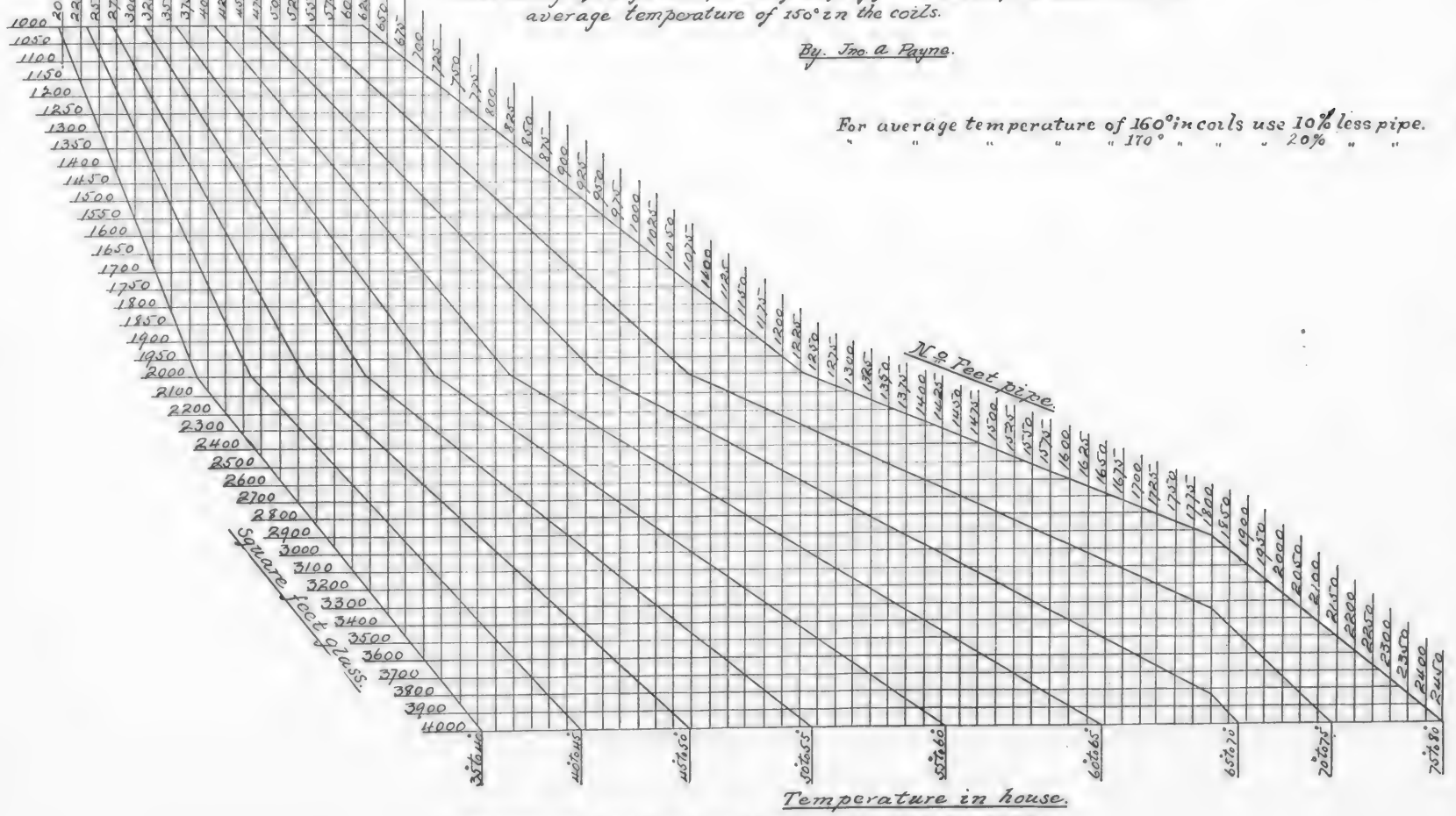
The accompanying is the third in a series of greenhouse heating charts compiled by Mr. John A. Payne for use in his own practice. The first was printed in our June issue and the second in July. Others will follow in due course.

Table N°2. 1000 To 4000 Sq Ft Glass.

Curves showing lineal feet of 3½" Inside diam. C.I pipe required for given amount of glass at given temperature in zero weather. Based on sides being 5 ft high composed of 25 ft of glass and 25 ft of wall, and an average temperature of 150° in the coils.

By. Jno. A Payne.

For average temperature of 160° in coils use 10% less pipe.
" " " " " 170° " " " 20% " "



GREENHOUSE HEATING CHARTS—No. 3. BY JOHN A. PAYNE

THE HEATING AND VENTILATING MAGAZINE

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THE annual meeting of the American Society of Heating and Ventilating Engineers next month promises to be the largest and most interesting of all the large and interesting meetings of that Society during its existence, and it now enters upon its twelfth year.

This meeting is the most important event of the year in heating circles. The Society, which for years had to struggle to make a place for itself and to put itself upon a self-supporting basis, has yet grown a little every year and now possesses a sufficient membership to make the annual dues cover the running expenses.

These running expenses, it may be said, have never been reduced to the extent of impairing the Society's work. It has done all necessary things that would have been done if unlimited means had been available and has done just as well as any Society has done such things.

This has meant considerable devotion and self-sacrifice on the part of the officers and committeemen, particularly those who were so unfortunate as to hold the secretaryship. It has also meant, at least once, a few years ago, a passing of the hat for contributions to make up a deficiency in the treasury. Fortunately, that is not likely to occur again, and the membership now contains names from all over the country and many from Europe, with at least one from the fighting islanders of Japan.

FOR the first time in the Society's history, the committee on compulsory ventilation legislation will have a report to make showing tangible results. The bill prepared by Superintendent of Buildings C. B. J. Snyder, of the New York Board of Education, and originally introduced by Senator A. A. Wray, which is the first definite law of the kind to be enacted anywhere, is a direct result of the efforts of the American Society of Heating and Ventilating Engineers. It is a step in the direction of improved health conditions in schools and other public buildings, the effect of which is likely to be so far-reaching that it is not easy to forecast its limits. Already school boards, architects and contractors throughout the state are awakening to the new requirements placed upon them by this law.

AN old-time steamfitter, while discussing the advantages of a technical training the other day, laid considerable stress upon the value of some experience in addition thereto. As an example he referred to a piece of work being done in a prominent New York building many years ago, when there was not much to be had in the way of long-sweep fittings and a good many long bends were wanted on this particular job.

The practice was to put in the straight pipes and then get the measure for a bent pipe to make the turn, but one day they encountered a particularly difficult angle. One of the engineers was an exceptionally capable

and scientific man and he was called upon to figure the curve of that bend. He was busy with a series of plumb lines and measurements when his less scientific partner came along and asked what was the matter. Upon its being explained to him he said: "Get a piece of one-eighth pipe." When that was brought, he said: "Now bend that so that it will make the right angle." That was easily done. Then he said: "Now take that to the shop and bend the large pipe to the same curve."

The other man would undoubtedly have got it all right, but it would have taken him an hour or so, while the bending of the one-eighth inch pipe was the matter of a few seconds.

This was the case of either a degree of experience which had involved the same kind of a problem or else it was the natural "gumption" that enables some men to see a practical solution to any mechanical difficulty.

A SMALL hardware man out West wrote to Chicago a few years ago for a book that would tell him how to heat a house by steam, or perhaps hot water. He said one of his neighbors had decided to heat his house in that way, and as there was no fitter in the town he got the job.

In reply he received a list of very useful books—some books that any fitter ought to have—but was told that there was no book that would enable him to install a proper heating job any more than a law book would tell him how to win a suit or a medical book would tell how to cure a fever.

AT the same time, the value of technical training is becoming more and more apparent as the ground work for the practice. I lately heard of one mechanical college in which there were twenty-four men about to graduate in the heating department. When the professor in charge was written to, to put a man in correspondence with some of these under-graduates with a view to taking a position, the answer was that they had all been engaged months before.

THE month just closing brings to a finish the most extraordinary year ever seen in the heating business.

The year opened under the clouds of a Presidential election year and of labor troubles which had, during the previous year, made life a dreary thing for everybody connected in any way with the building lines. Nobody felt like proceeding at more than the slowest rate and with one hand on the brakes, the other on the reverse lever and a sharp eye ahead for danger signals.

Everything suddenly changed as the summer ended, and since that time it has been a case of overwork all around. Strikes vanished and workmen worked. Owners who had been holding up their contracts placed them, with time limits, and steamfitters filled the mails with hurry-up orders.

All this is very good, but what is still better is the fact that so far as the eye can reach at present there is a clear track ahead and now the expectation is that 1905 will show the greatest heating year in history.

Manufacturers are already preparing for it, and have been preparing for weeks. New factories are building, additions making to old ones, new equipment being provided and everything possible being done to meet the expected demand.

I have seen many instances of the cultivation of extraordinary powers of memory that are familiar to most of us, but here is an interesting one about the late John Davis, of Chicago.

A prominent western man, who was associated with Mr. Davis years ago and knew him all his life, told me the other day that he once drove around the city with Mr. Davis, visiting a number of buildings where work was being installed, and in nearly every case the foreman had a little specification of articles which he needed in order to proceed with the work. Mr. Davis made no memorandum of any of these specifications, but on returning to the office took a sheet of paper and, beginning with the first job visited, wrote down the number, kind and sizes of all the valves, fittings, lengths of pipes, etc., read off to him from the memoranda of his men. He said this was perfectly easy, as he had been doing it all his life and was not likely to forget any item, while he would not put in a wrong thing because of his knowledge of what was required on the job.

The conversation that resulted suggested a further test of his memory, and having occasion a little later to visit the basement of a building near by, Mr. Davis remarked on coming out that he could put down on paper every line of pipe, indicating every joint, coupling, nipple, fitting and valve, with the sizes all correct. On being challenged to make good, he got a big sheet of brown paper and put it all down, starting from the boiler and working out each line correctly. The doubter took the paper and went all over the basement trying to find a mistake but could not do it.

While there are not many who can specialize their faculties of memory to this extent, it is easy to see how valuable it is to acquire as much ability as possible in this direction, not only for the saving of time in making memoranda, but as a check to guard against errors in specifications, orders and plans.

I knew a man who, in the old rule-of-thumb days of figuring up heating jobs, told about going out of town to put in a certain plant and came so close to having his piping figured up that by stealing the pipe handle off a wrench he completed the job and came home with no goods to return and without having to send home to the shop for additional material to supply any deficiencies.

That was good work—the kind of accuracy that comes from carefulness and long experience.

But I regret to have to record that even this man's excellent calculations did not always work out right. I have lately heard of a case where he got so balled up on the sizes of his mains that on one job six of them had to be taken out and replaced with others, two sizes larger.

Presumably he was misled by some erroneous information or data, but in any case the outcome showed the possibilities of a good man going wrong.

I knew another man who could not possibly read a plan and grasp any idea of what it was all about, but boasted that when he came home from a job, he could bring all of the left-over pipe and fittings in his coat-tail pocket.

This was possibly true, but I think his average was three or four times of putting up a job. He would have the piping put up and look at it, and then

say it was all wrong and that it must be taken down and put up some other way, and then again until he got it right. It was really a good job when he got it done, and he did not have very much material left over, but the expense of piping a job three or four times would pay quite a little freight for surplus material on carefully designed and well followed out working drawings.

Thus do things frequently balance themselves up, and the old saying that "some things can be done as well as others" does not always work out.

D. M. Nesbit, president of the new British Association of Master Steamfitters, former president of the British Institution of Heating and Ventilating Engineers and president of Ashwell & Nesbit, Ltd., London and Leicester, and former member of the Board of Governors of the American Society of Heating and Ventilating Engineers, who lately spent a few weeks in this country, sailed for home November 26.

While here he has covered this side of the country pretty well, getting as far west as Chicago, and has seen many of his old friends. On departing for home, he studied the war map and the naval charts and although he found that according to the best information obtainable the Baltic fleet was somewhere between Tangiers and Vladivostock, there was still the possibility that they might go around the other way, so he felt safer in taking an American line steamer, the St. Paul, formerly prominent as an auxiliary cruiser during our little disagreement with Spain. That seemed to make a pretty safe combination, which was strengthened by the presence of H. S. Downe, European manager of the American Radiator Co.

A small bunch of friends gathered at the pier to see them off, among whom were Mr. and Mrs. E. D. Smith, H. A. Smith and Miss Marion Smith, H. B. Gombers and W. M. Mackay.

Among the little tokens appreciative of a few weeks' residence on this side was a copy of *The Simple Life*, contributed by Mr. Gombers.

Nesbit's first appearance in this country has been the subject of some innocent merriment, but it has always appeared to me that the laughter was really on his side. He showed up at the National Convention of the Master Steamfitters at the Broadway Central Hotel in New York in 1894. In those days the American Society of Heating and Ventilating Engineers was young and the Master Steamfitters used to devote some of their time to the discussion of practical and theoretical questions. Drawings were exhibited and papers were read and discussed. Our English friend apparently came over here on a missionary trip to show the poor benighted heathen how to do steamfitting, and one day when the Association went into session they found the walls covered with blue prints showing "how we do it at home." The principles and methods involved were ably exhibited by Brother Nesbit and, as might have been expected, each point was promptly jumped upon by the more progressive Americans—because whatever may be the case to-day, at that time we were about two or three centuries ahead of our cousins across the water, particularly in all things relating to steam heating.

But, every jump jumped a dollar, or perhaps a sovereign, into the pockets of the English firm of Ashwell & Nesbit, and our visitor went home so full of ideas that he has been reaping a golden harvest ever since —and it is not reported that he was particularly hard up before.

Incidentally, acquaintances and friendships were made and a liking for this country formed, which resulted in many visits since then, so that the name "Nesbit, of New York and London" appears to have impressed itself upon even the steamboat people, because the passenger list of the St. Paul contained the names of "D. M. Nesbit, of New York," and "H. S. Downe, of London."

CORRESPONDENCE

A Correction

Editor HEATING AND VENTILATING MAGAZINE:

I beg to call attention to a typographical error in my article, "Computation of Radiating Surface," in your November issue. In the explanatory table for the radiation chart on page 180, the fifth line from the bottom should read, "For heating only halls and corriders (0 degrees to 70 degrees) add 50 per cent."

J BYERS HOLBROOK.

Computation of Radiation

Editor HEATING AND VENTILATING MAGAZINE:

In the chart for the computation of radiation prepared by J. Byers Holbrook and published in your November paper, I do not find that he specifies a definite ratio to add for exposure on the side of the coldest prevailing winds. What would you suggest?

ENGINEER.

ANSWER

When the coldest winds come, say, from the northwest, it is customary, we believe, to add ten per cent. to all rooms on the north side of the building, ten per cent. to all rooms on the west side of the building and 15 per cent. to northwest corner rooms.

We have communicated with Mr. Holbrook over the telephone about this and he concurs with the above.

Another

Editor HEATING AND VENTILATING MAGAZINE:

I do not agree with what Mr. Holbrook says about the difference in the temperature of the water in the flow pipe of hot water system. He gives 36 degrees, which I consider too much for a well designed system.

Also, I would like to ask what modification Mr. Holbrook would make of his chart for use in residences or ordinarily exposed buildings, as I notice he confines the application of his chart to city office buildings.

S. K.

Heating Competition

Editor HEATING AND VENTILATING MAGAZINE:

In the Smoking Compartment of your October Magazine you refer to the way heating men used to go after work. I want to tell you that they do just the same thing now.

SALESMAN.

ANSWER

Our correspondent is young. What is done in these days is not in it with what we used to do a few years ago. Moreover, the heating manufacturer is, as a rule, out of competition, and the question is one for the heating contractor alone.

The Reck System

Editor HEATING AND VENTILATING MAGAZINE:

In the paper by Dr. Gradenwitz on "Some Novel Heating Systems," in your November magazine, the author speaks of the Reck system, about which I read something earlier in the year.

Can you tell me if that system is in use anywhere in this country, and if there is anyone here who is interested in it.

C. F. O.

ANSWER

The Reck system is controlled in this country by the L. H. Prentice Co., Chicago. The system was thoroughly discussed at the meeting last January of the American Society of Heating and Ventilating Engineers, Capt. Reck being present and explaining his drawings and his methods.

Ventilation

Editor HEATING AND VENTILATING MAGAZINE:

I have your sample copy and shall be pleased to be a subscriber.

I notice that in the proceedings of the American Institute of Heating and Ventilating Engineers you describe Mr. David Grove, the noted heating and ventilating engineer, of Berlin, as "an American."

Mr. Grove told the writer that he was an Englishman; in fact, a "Cockney."

I have had the pleasure of inspecting the heating and ventilating plant at the new German House of Parliament, and whilst not able to speak of the efficiency of the plant, everything necessary for a very complete apparatus is there, and expense appears to have been of no consideration.

As to the merits of the different systems of ventilation, the practical engineer can make a success of either plenum or vacuum, or a combination of the two, one or the other, or both, being suitable for different styles of buildings, but for any man to talk about non-mechanical ventilation, so-called automatic, and attempt to convey to the public that it will change the atmosphere of a building under any of the prevailing conditions existing in this country, is not the experience of a practical engineer.

What stands in the way of the general adoption of mechanical ventilation is usu-

ally the expense, and whilst all the so-called automatic ventilators are better than a hole in the roof, inasmuch as they usually keep the rain out, they can never be a solution for ventilation.

Yours faithfully,

H. H. JENNINS.

Leeds, England, October 13, 1904.

ANSWER

There was no misunderstanding on our part in regard to the nationality of Mr. Grove. The mistake was made by the Englishman, Bibby, and when his remarks were quoted at our meeting nobody took the trouble to make a formal contradiction, although there was some discussion which we may arrange to get into the official report of the meeting.

We are much obliged for your letter calling attention to the facts in the case.

Vacuum Hot Water Heating

Editor HEATING AND VENTILATING MAGAZINE:

To-day in looking over your August number I noticed the article of C. T. J. on Vacuum Water Heating. I had previously read it, but the whole thing struck me so comically that I felt like doing it myself, hence this article.

C. T. J. says: "I was at the Detroit meeting and heard Mr. Hoyt present his scheme of Water Vacuum Heating." I was there myself and did not know that any "scheme" was presented. I stated some facts in regard to vacuum water heating that I had practically demonstrated in my plant, which combines greenhouse heating with dwelling heating. It is quite a large plant, and the dwelling being about 125 feet distant from the boiler (pipe line six inches at boiler and four inches where it enters dwelling) makes quite a test for any system of heating.

I don't think I advanced any theory, scheme or anything visionary, but stated what I had done (not all that I did, and was doing by any means), and that the members and guests did not understand the modus operandi was no fault of mine. But C. T. J.'s article does not prove anything, much less disprove any of the facts I presented at the Detroit meeting. He proves only one thing, and that doesn't need proving, that the conditions in a water plant are the same under all circumstances whether vacuum or pressure. A wagon would be the same, empty or loaded, but the running conditions would differ; and a water plant would, like the wagon, be the same empty or loaded (vacuum or pressure), but the running, as regards economy in fuel and attention, is what tells and is what I presented at the Detroit meeting. I have had nearly forty years' experience in heating hot air flues, hot water with modern boiler and tank system, hot water in radiators and long lines of pipe, steam heating, vacuum steam heating and vacuum water heating, and while C. T. J. may pronounce the last a "dream," it is a darned good dream to me and shows up in my bank book, and I would like a few more dreams of a like nature. If C. T. J. will visit my plant he will see a good many of what he calls "schemes" that will be beyond his ideas of an ideal water job. A. T. HOYT.

Warren, Ohio, December 5, 1904.

Ventilating Tall Buildings

Editor HEATING AND VENTILATING MAGAZINE:

In an editorial in your October paper about the ventilation of tall office buildings, you state that on the upper floors the draft is from the hall outward and not inward from the windows. Why is this? It seems to me that if there is a tendency for the air to flow inward anywhere, it would flow inward everywhere.

My experience has not been with what you call tall buildings in New York, but I have never found any difference between the upper and lower floors in the buildings which we have heated.

There is the same atmosphere outside and the same temperature inside.

L. S. F.

ANSWER

That would be true if there was a sufficient opening at the top of the elevator shaft or at the top of the hallway to take away the air that comes in. What comes in must go out somewhere. The hottest air in the halls is at the top, and that makes an upward current in the halls which must escape through any openings which it can find. Those openings are commonly provided by the open windows of the upper floors and there the air goes out, while on the lower floors there is a considerable inflow.

That was just the condition sought to be overcome by the design referred to in our editorial; the creation of a pressure in the hall made the air go out through the windows of all of the offices and each floor was supplied with the air brought in by the blower fan.

Productive of Great Good

Editor HEATING AND VENTILATING MAGAZINE:

We have just read very carefully the editorial in your October issue which relates to the price policy of to-day.

This article is certainly interesting reading, and if carefully weighed by the manufacturers and jobbers, should be productive of great good to us all.

Yours very truly,

MODEL HEATING CO.

Philadelphia, November 1, 1904.

NEW DEVICES

"Comfort" Boilers

The "Comfort" steam and hot water heater is an improved pattern of the round vertical sectional type, without jacket, which for years has been so deservedly popular. It is attractive in design and superior in workmanship.

"COMFORT" STEAM BOILER

The fire pot is round and deeply corrugated on the inside, greatly increasing the direct fire surface and at the same time providing an ample fire chamber which, when filled, will maintain a good, strong fire without constant attention.

A distinctive feature in the construction of this heater is the extended heating surface in the fire chamber, which is formed by a series of lobes or projections which extend downward over the hottest part of fire, coming in contact with the best products of combustion, thus greatly increasing the amount of direct horizontal fire surfaces, and at the same time dividing the water so as to bring the largest proportion in direct horizontal contact with the fire, insuring great economy in fuel and a perfect and continuous circulation.

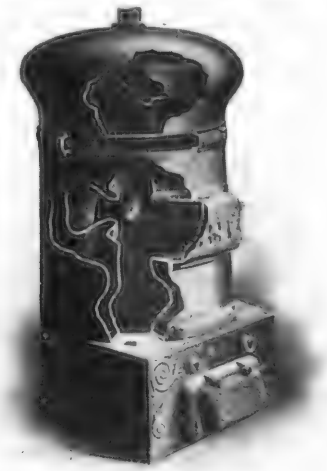
The products of combustion ascend from the combustion chamber through a series of flues which are conical in form, the opening being much larger at the bottom, where the gases enter, than for their exit at the top. This gradually retards the upward course of the heated smoke and gases, bringing them in direct and constant contact with the water surfaces for a much longer period than if straight flues were used. The sections are placed alternately, to stagger the flues so that the heated gases may be distributed uniformly over the entire surface before escaping to the dome.

Much of the heating surface is self-cleaning, but suitable clean-out doors are conveniently provided so that all parts can easily be reached and kept free from soot.

The "Comfort" is simple to erect; being low in height, it is especially suitable for low cellars. It is provided with a large feed door and requires but little attention, being automatically regulated.

The grate is the latest improved pattern and operates in two parts, so that one part of the fire can be cleaned independently of the other. It is easily operated from the front by a shaker and is so fitted that ordinarily a single turn of the shaker effectually cleans the fire. These grates can easily be removed without disturbing any other part of the heater.

The ashpit is of proper depth, allowing ample space for the removal of ashes and for admission of air necessary for perfect combustion. It is provided with a large and properly fitted door, in which is placed a lifting draft damper that can easily be regulated in connection with adjustable damper regulator.



"COMFORT" HOT WATER HEATER

A clinker door is provided through which a slicing bar or poker may be inserted for the removal of any ashes or clinkers that may have accumulated.

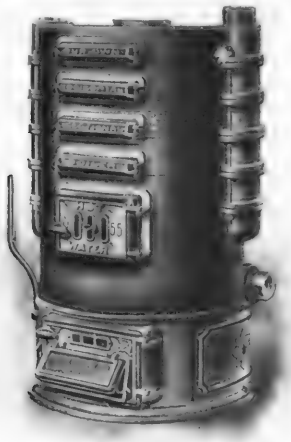
Three sizes of these boilers are completed and three sizes are in process of construction. When completed, the line will range in capacity from 900 to 1,600 feet of water radiation and from 550 to 975 feet of steam radiation.

The "Comfort" line is made by Thatcher Furnace Co., 240 Water street, New York.

"Our Own" Boilers

We illustrate herewith series D of "Our Own" boilers manufactured by the Novelty Iron Co., Canton, Ohio.

Series D is made up of horizontal sections so placed that the fire and heated



"OUR OWN"—SERIES D

gases come in direct contact with the flat surface of each section as they pass through the flues on their way to the smoke pipe.

The corrugated inner walls of the fire pot and the arched shape of its top are said to present at least one-third more

"OUR OWN"—SERIES F

heating surface in the fire pot than in other boilers having straight walls.

The sections above the fire pot are concave, and a water leg formed at the outside adds materially to the effective heating surface of each section.

The spaces between the sections are ample for the perfect combustion of the gases, and the entire heating surface is easily accessible for cleaning.

The sections and the fire pot are connected with steel, tapered push nipples, making a joint which is indestructible and which will compress and not crack the sections when they are forced together.

The circulation of the water in this boiler is very rapid. The water entering the boiler at the bottom passes around the fire pot, and thence up and across the top.

The circulation is very direct, causing the least possible friction in the boiler.

The grate is of the rocking and dumping type; it can be removed through the ash pit door by simply removing two bolts. Clinkers can be removed from the grate through the ash pit door without the necessity of dumping.

On the whole, the boiler is an excellent one and can be relied upon to readily take care of its scheduled rating.

Catalogues and prices may be obtained from the manufacturers.

Shirley Two Column Radiator

The accompanying illustration represents the new two column radiator manufactured by the Shirley Radiator & Foundry Co., Shirley, Ind.

The manufacturers invite special attention to the neatness of the design,

SHIRLEY TWO COLUMN RADIATOR

the effective shape of the section and the unusual air space between radiating surfaces.

These are the most essential points in any radiator, and extraordinary pains have been taken in this case to approximate perfection.

The Shirley three column radiator, which has been on the market for some time, has been most favorably received

and many compliments have come to the manufacturers from those of the trade who have used the goods. They believe that the two column pattern will fully come up to the standard established by the three column.

Lists and prices may be had on application to the manufacturers.

Gurney Boilers—"400 Series"

The Gurney "400 Series" of steam boilers and hot water heaters are confidently recommended by the manufacturers. The points of excellence which they claim are the following:

The sections are so arranged that the fire and heated gases come in direct contact with every part before their final exit to the smoke chamber, thus exposing large and effective heating surfaces to the direct radiant heat of the fire, fully utilizing the gases and insuring efficiency and economy of fuel.

The sections are connected by the use of taper push-nipples, making the most permanent and indestructible water joints. All fire surfaces are easily accessible for cleaning by means of clean-out doors provided for that purpose.

Round, deep fire pots, insuring slow and perfect combustion of fuel, and maintenance of an even temperature for a considerable length of time without attention.

The steam boilers maintain a steady water line and economy of fuel and generate steam quickly.

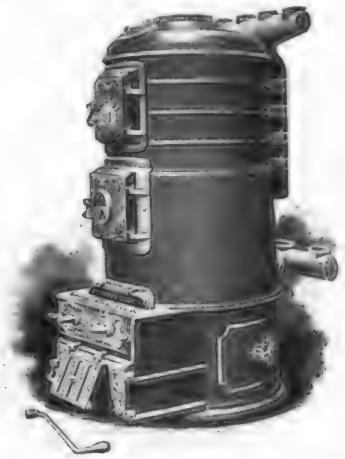
GURNEY STEAM BOILER—"400 SERIES"

Each boiler is fitted with a large circulating and equalizing pipe, which insures a steady water line and the delivery of dry steam to the system.

In the hot water boilers, coil holes are arranged in the fire pots for the introduction of a coil over the fire when so desired for heating water for domestic use.

Excellence of design and construction and the best quality of iron and workmanship assure the greatest durability and efficiency in operation.

Improved Franklin Grates, as used in this series, have ample air spaces, resulting in the most perfect combustion of the fuel, and the construction insures the utmost ease for effectively removing clinkers and ashes from the bottom of the fire.



GURNEY HOT WATER BOILER—"400 SERIES

A clinker door is also provided.

This line of boilers is made by the Gurney Heater Mfg. Co., 74 Franklin street, Boston.

Central Station Heating

In this country the central station heating system is widely used, but in Europe is less known. In Dresden, the Saxon government is trying what it regards as an experiment by erecting a central steam heating system containing ten generators producing 50,000 to 60,000 pounds of steam per hour. This is to heat the Royal palace, a picture gallery, a museum, a church, etc. The same plant will also furnish electricity for lighting purposes.

Heating of Public Schools—An Inquiry and an Answer

A few weeks ago Dr. W. H. Maxwell, Superintendent of Construction of New York City Public Schools, received the following letter from the superintendent of public schools in another city.

November 16, 1904.

Dear Sir: Having been Superintendent of the ———— Public Schools for years, and being a member of the Board of Education, I am naturally desirous to do all that is in my power, not only for the intellectual development of the pupils, but also for their health and comfort.

We have issued sufficient bonds to build at least three new school buildings, which

will range in size from twelve to eighteen rooms. We realize that one of the most, if not the most, important points in connection with the building is the heating and ventilating system. We are considering the adoption of one of the four following systems:

1. Mechanical Steam Blast, i. e., steam coils in the basement, with blower behind same, operated by engine to distribute the air throughout the building, and boilers for generating steam; stacks leading from rooms to carry off the vitiated air.

2. Mechanical Furnace Blast, i. e., furnaces assembled in a battery in the basement with a blower and engine for distributing the air throughout the building; stacks leading from rooms to carry off vitiated air.

3. Direct-indirect Steam System, i. e., steam boilers in the basement, with radiators located in each of the rooms, with openings behind same to admit the air from outside; stacks leading from the rooms, heated by steam coils to create circulation.

4. Direct-indirect Hot Water System, i. e., water boiler in basement, with radiators located in each of the rooms, with openings behind same to admit air from outside; stacks leading from rooms, heated by water coils to create circulation.

I earnestly request that you give me as full a letter as time will permit, giving your experience with each of the above systems, also recommending the system which you have found to be the most satisfactory, both as regards heating and ventilation. Kindly give your reasons for preference and your objections to the ones you do not recommend.

Thanking you in advance for the kindness of an early reply, I am,

Yours very truly,

———

This letter was turned over to Mr. C. B. J. Snyder, Architect and Superintendent of Buildings of the New York Board of Education, who found it among the accumulated mail on his return from a European trip.

Mr. Snyder's answer, which follows, is quite as interesting as the letter of inquiry.

———

Dear Sir: I have just returned from a vacation and find your communication addressed to Dr. Maxwell, which has been referred to me.

In considering your communication I cease to wonder that Boards of Education get into all sorts of difficulty with heating apparatus, when they persist in sending broadcast letters of inquiry upon strictly technical subjects, addressed to men whose professions lie in other directions.

You will never obtain satisfactory results unless you employ a competent consulting engineer (of whom you must have several in your city), accept his recommendations and hold him absolutely responsible for the results. I just recall that Mr. ———, of our Society of Heating and Ventilating Engineers, resides in your city.

In order to avoid any misunderstanding I reply to your questions in regard to systems as you quote them, the answer following each one:

System 1. "Mechanical Steam Blast." That is, steam coils in the basement and blower behind same, operated by engine to distribute the air throughout the building, and boilers for generating steam; stacks leading from rooms to carry off vitiated air."

ANSWER

We have used but one plant of this system, and that is installed in quite a large building. The objections to it are numerous, the most important one being the possibility of a break down of the engine, which necessitates the closing of the building. It may be possible in a small building to so arrange the heating chambers that in case of the engine being put out of commission, heating may be accomplished by gravity, but we cannot afford to take such chances in our school buildings.

System 2. "Mechanical Furnace Blast." That is, furnaces assembled in a battery in the basement, with blower and engine," etc., the same as System 1.

ANSWER

We have not installed a plant of this kind and can see no advantage in doing so.

System 3. "Direct-indirect Steam System. That is, steam boilers in the basement, with radiators located in each of the rooms, with openings behind same to admit air from outside; stacks leading from rooms heated by steam coils to create circulation."

ANSWER

This system has worked quite satisfactorily, but circulation was created by exhaust fans, which are much more positive in action than steam coils.

We do not favor the installation of this system in our larger buildings because of the occasional failure of the janitors to properly close the openings at night.

System 4. "Direct-indirect Hot Water System," arrangements being the same as System 3.

ANSWER

I should be unwilling to install a system of this character for the reason that there is constant danger of a "freeze up," caused by neglect of the janitor.

The necessities for our work have caused us to lay out our heating and ventilating upon the following lines:

Adequate flues for the admission of fresh, warmed air for ventilating purposes only, for each room, and adequate flues for exhaust of foul air from same.

Steam plant in the basement supplying steam to coils in heating chamber, in which the air is heated not over 71 degrees, being forced into the rooms by means of a blower, and either an engine or electric motor. This air is used for ventilating purposes only, but is often entirely sufficient for heating. In order to provide, however, for proper temperature in cold weather we install direct heating surface, radiators underneath the windows in exposed locations, sufficient to heat the room under all circumstances.

Both the heating stacks and direct radiation are under automatic control.

Such a plant as this may cost a trifle more on first installation, but is "fool proof" and will give entire satisfaction under all conditions.

We find hot water heating economical as to consumption of coal and should recommend it for buildings which are to be warmed continuously for each twenty-four hours during cold weather, but the chances of permitting the apparatus to freeze, owing to neglect of the janitors during cold spells, especially the holidays, are too great to be assumed by any consulting engineer.

Very truly yours,
(Signed) C. B. J. SNYDER.

The Policy of the National Founders' Association

In abrogating the New York agreement the National Founders' Association has taken a very important step. This agreement was the link which connected the association with the Iron Molders' Union of North America, and through the operation of which an effort was made to harmonize the relations of the general foundry trade with their union workmen. It was a manifestation of the desire to conduct the labor question in the general foundry trade on somewhat parallel lines with those which had been established in the stove branch. Much thought and time were bestowed on the New York agreement, which was adopted at a conference of representatives of the two parties in 1899. In view of the interest which now attaches to this document it is herewith reproduced:

Whereas, The past experience of the members of the National Founders' Association and the Iron Molders' Union of North America justifies them in the opinion that any arrangement entered into that will conduce to the greater harmony of their relations as employers and employees will be to their mutual advantage; therefore be it

Resolved, That this Committee of Conference indorses the principle of arbitration in the settlement of trade disputes, and recommends the same for adoption by the members of the National Founders' Association and the Iron Molders' Union of North America, on the following lines:

That in the event of a dispute arising between members of the respective organizations a reasonable effort shall be made by the parties directly at interest to effect a satisfactory adjustment of the difficulty, failing to do which either party shall have the right to ask its reference to a committee of arbitration, which shall consist of the presidents of the National Founders' Association and the Iron Molders' Union of North America, or their representatives, and two other representatives from each association appointed by the respective presidents. The finding of this committee of arbitration, by a majority vote, shall be considered final in so far as the future action of the respective organizations is concerned. Pending adjudication by the committee of arbitration there shall be no cessation of work at the instance of either party to the dispute. The committee of arbitration shall meet within two weeks after reference of the dispute to it.

It will be observed that this agreement is not, strictly speaking, an arrangement for arbitrating disputed points. No provision is made in it for the selection of an odd man in case the two sides, which have equal representation, fail to agree. It was an instrument designed for the purpose of conciliation. When two disputants have equal representation on a board of appeal a decision can only be arrived at by one of the parties becoming convinced that the other is in the right. The board of appeal thus becomes a tribunal for the settlement of questions through their more thorough discussion by parties who may not be directly interested. The difference between arbitration and this form of handling disputes is very great. The odd man on a board of arbitration may be wholly disinterested, thoroughly unbiased and free from prejudice. But a decision given through his vote may fall far short of convincing the defeated party that the winner has the right side of the contention. The New York agreement, with its motive of conciliation, was regarded as the ideal method of avoiding strikes and was adopted for that reason.

In practice, however, this agreement has failed to accomplish its purpose. Some of its provisions have borne fruit to a limited extent, it is true, but in the great majority of cases in which its aid has been sought for relief by employers it has proved valueless. This has been the case more especially the past year. While conciliation in some branches of trade is practiced, yet even in those, if its results are carefully scrutinized, it will be found that the conciliation is wholly on one side. The employer may be deeply sensible of injuries and abuses inflicted upon him, but with a conciliation agreement he is powerless and his wishes for reform and improvement have no effect. The substitution of arbitration for the New York agreement is expected to work more equitably. A board of arbitration will not

simply discuss and disagree, but it will decide. If the employer has justice and reason on his side, he has at least some show of securing judgment in his favor.

In taking this action the National Founders' Association is placing itself in a similar position to other employers' organizations who have found that in dealing with a union as too frequently officered and conducted the union concedes nothing, but perpetually claims a greater share in the conduct of the business which provides employment for its members.

Heating and Ventilation of Hospitals

The successful heating and ventilation of a hospital is a vital problem, and the only absolute rules that can be laid down are those treating, not of manner or detail, but of practical results.

The requirement is, for all northern latitudes, from 3,000 to 5,000 feet of air per patient each hour, warmed indirectly to at least 70 degrees F., whatever the outside temperature. This means an expensive plant and an enormous coal consumption, also every precaution in the way of double run of sash or double glazing, vaulted walls, etc., to assist as much as possible in preventing the loss of heat through unnecessary radiation.

In warmer climates construction can be simpler and cheaper, and the radiation can be less with more "direct" work, relying largely on natural circulation for ventilation.

Some authorities maintain with considerable force that the sick wards should not be maintained at an unvarying temperature, that nature in its continual change of many degrees from noon to midnight shows that there is a necessity in this direction. If this varying condition is necessary in maintaning health in well people, why not in restoring health?

The perfect heating plant will be in a special building by itself or one having the laundry in a second story. It should be installed under one of the hospital buildings only as a temporary expedient when the finances absolutely preclude a special building.

High pressure steam should be installed in a complete, perfected plant, to be used for power, laundry machinery, electric light, ventilation and sterilizing as well as for heating.

If the institution is too small to employ an experienced engineer, a low pressure steam boiler can be installed for heating and a small high pressure boiler can be used for the other purposes enumerated.

In small hospitals it will generally be found best for economical reasons, both as to installation and maintenance, to install a low pressure system. This will give no power for laundry machinery, which in a very small plant must be omitted, and it will give no high pressure steam for disinfecting, sterilizing or for inducing draft in the vent flues, all of which are quite necessary, but are impossible without considerable expense. The sterilizing can be done quite as successfully by gas, and in the summer the ventilation can be by means of the windows and doors and special flues in toilets, heated by Bunsen burners. Whenever possible it is wise to install a small high pressure boiler in addition to the low pressure heating boiler for the various purposes named above.

Some of the most expensive and elaborate schemes of ventilation are often found to be perfect in theory but very defective in actual use. It takes coal to run a perfect system of heating and ventilation, and the engineer is apt to try to show his great worth by saving coal and by cutting off the electric fans as much as possible. In an institution inspected some time since, where the superintendent was very proud of his ventilating scheme by which the foul air was drawn up into the loft by electric fans and discharged through roof ventilators, it was suggested that sometimes these fans were found entirely cut off, with no ventilation at all. He was sure that his never were, and went up to the loft to investigate, and found, what was apparent from the stagnant air in the wards, that they were not running.

While inspecting last year one of the finest and newest hospitals in a remote section of the country, I found very small hot air inlets and vents and foul air everywhere, and apparently no ventilation at all. Expressing to the engineer a desire to make a study of his heating and ventilating plant, he informed me that they had the most complete and expensive scheme in the entire West, laid out by the best engineers, and that the results were perfect. Replying to my statement that the air seemed bad and the ventilation poor, he said: "These fans will do it and do it quick. Why, you can imagine how thick the air gets in the wards by morning. You can almost cut it with a knife. I start the fans, and in half an hour the air is as pure and sweet as outdoors." To run the fans half an hour, morning and night, may be ventilation, but it ought not to be so considered. What is needed is not fresh pure air in two half-hour periods per day, but all the time.

In a small hospital situated in a broad expanse of green lawns, the necessity of taking the air for the heating coils from an elevation is not as necessary as in the city hospital, where the air at the ground level is full of dust and dirt and all manner of impurities. Under these ideal conditions the introduction of the air through wire mesh covered openings directly to the stacks serves the purpose very well, but a dust-settling chamber that has the bottom hinged for cleaning is a safeguard, and the stacks should have slides so placed that every portion of the rough dust-collecting castings can be thoroughly brushed and cleaned. When the basement under the pavilion is used as a plenum cham-

ber, as is quite commonly the case, the entire room should be finished as smooth as possible with a plastered ceiling, smooth pointed walls covered with a coat of limewash and a coat of cheap water-proof enamel, with a smooth cement concrete floor sloping to a catch basin and drain, so that it can be thoroughly cleansed and purified with a hose. Usually the heating and ventilating flues are entirely inaccessible, and are therefore never cleaned. The register faces are screwed in place and never removed. They are generally so constructed as to be specially fitted to catch and hold dust and filth and be almost impossible to thoroughly cleanse, and the flues are loaded with filth that can never be removed.

The best practice is to omit, as far as possible, the register face entirely, and thus to open both the heating flue and the vent flue to inspection and dusting. When the heating flue enters the room, as it should, at least 8 feet from the floor, there is no danger of its being used by patients to throw rubbish into, and the vent flue opening at the floor is much more easily adjusted without a register. The mixing valve under the control of the nurse can be arranged to the amount and quality of the air admitted.—*B. E. Taylor, in The Brickbuilder.*

ASSOCIATION NEWS

American Society of Mechanical Engineers

The fiftieth annual meeting of the American Society of Mechanical Engineers was held at the society's house in New York, December 6-9, President Ambrose Swasey presiding.

The following officers were elected: President, John R. Freeman, Providence, R. I.; vice-presidents, S. M. Vauclaim, Philadelphia; H. H. Westinghouse, Pittsburg; F. W. Taylor, Philadelphia; treasurer, W. H. Wiley, New York. Managers, Geo. M. Brill, Chicago; Fred J. Miller, New York; Richard H. Rice, Lynn, Mass.

American Society of Heating and Ventilating Engineers

Exceptionally pleasant quarters have been arranged for the meetings and the dinner of the American Society of Heating and Ventilating Engineers to be held at the Hotel Astor, New York, January 17, 18 and 19.

Secretary W. M. Mackay also has promise of a sufficient number of interesting papers to make the sessions valuable to all members and guests who attend. There is reason to believe that the attendance will surpass all previous records.

The nominating committee have presented the following names to be voted for to hold office during 1905:

For President—Wm. Kent, John Gormly.

For First Vice-President—R. P. Bolton, H. L. Hall.

For Second Vice-President—C. B. J. Snyder, J. J. Blackmore.

For Secretary—W. M. Mackay, H. A. Joslin.

For Treasurer—U. G. Scollay, F. P. Blodgett.

For Board of Governors—J. C. F. Trachsel, W. N. Haden, James Mackay, B. F. Stangland, B. H. Carpenter, C. R. Bishop, Thomas Barwick, W. M. McKiever, H. A. Loeb, A. B. Franklin.

Secretary Mackay reports the following newly elected members:

Members

Ralph Collamore, Detroit, Mich.
Bert. C. Davis, Kansas City, Mo.
Thomas M. Dick, West Raleigh, N. C.
James A. Donnelly, New York.
Wm. F. Dugan, Los Angeles, Cal.
Howard H. Fielding, Denver, Col.
Bernard Gause, Jacksonville, Ill.
Walter Jones, Strourbridge, England.
Joseph P. Lisk, Troy, N. Y.
Lucien Rouquaud, Paris, France.
Fred R. Still, Detroit, Mich.
Ralph S. Thompson, Springfield, Ohio.
Hugo Erich von Boehmer, Berlin, Germany.

Associates

Joseph Graham, New York.
James M. Heatherton, New York.
Robert K. Story, New York.

Junior

Cornelius M. Slotboom, The Hague, Holland.

Among those who have furnished or promised papers for the meeting are: Prof. R. C. Carpenter, Reginald Pelham Bolton, Chas. F. Hauss, John Brennan and James A. Donnelly.

National Association of Master Steam and Hot Water Fitters

Master Steam Fitters

The semi-annual meeting of the New York State Association of Master Steam and Hot Water Fitters will be held at the Arean, Thirty-first street, near Broadway, New York, Monday, January 16.

This date was fixed by reason of the meeting on the following day of the American Society of Heating and Ventilating Engineers, which should prove a feature that would draw to New York some of the Master Fitters who otherwise might not attend. Without regard to this, a goodly number is confidently expected to be present.

TRADE AND MISCELLANEOUS NOTES

PHILIP H. McOMBER, assistant treasurer of the U. S. Heater Co., Detroit, Mich., died December 5 after a second operation for appendicitis. Mr. McOmber was a married man, 33 years old, and had been with the company for a number of years.

Mr. McOmber not only was an exceptionally valuable man to his company, but was most highly esteemed by his associates for his personal qualities.

J. M. ABBOTT, of Abbott & Haverly, Greenfield, Mass., died November 30, at the age of fifty.

JAMES H. WILLIAMS, president of the famous drop-forging firm of J. H. Williams & Co., Brooklyn, died December 5 at the age of fifty-nine. Mr. Williams started the drop-forging business at Flushing, N. Y., and removed to Brooklyn twenty years ago. Mr. Williams was as celebrated for his treatment of his employees and for his general public spirit and philanthropy as for his great business success.

CRANE CO., Chicago, have opened a branch office at Dallas, Tex., having taken over the business of D. F. Sullivan and of Young, Heintz & Co.

They have also opened a branch office at Memphis, Tenn., succeeding the supply house of J. H. Coffin & Co., 224 Front street.

S. A. TEEL & CO., Bangor, Pa., succeeds O. P. Snyder in the heating and plumbing business.

ROBERT CAMPBELL HEATING CO., manufacturers of heating apparatus, 166 Beekman street, New York, have made an assignment. This business was started in 1892 by Robert Campbell, the president and treasurer of the company. He has been in ill health for some time.

The liabilities are understood to be less than $10,000; the assets consist of some stock and some accounts, the full value of which has not yet been arrived at.

F. G. GRANNIS & CO., San Francisco, Cal., are reported to have failed. We have not the list of assets and liabilities.

ELK HEATER MFG. CO., has been incorporated at Columbus, Ohio, with a capital of $10,000.

J. A. JACKSON, Des Moines, Ia., has bought the business of the Richmond Heating & Plumbing Co., 410 W. Seventh street.

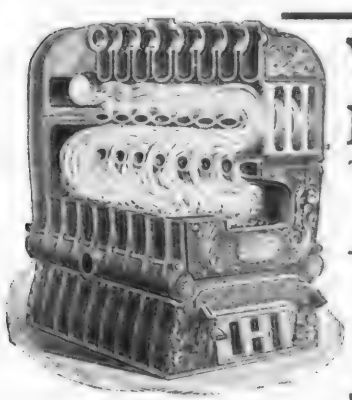
J. A. ROSE, 765 Sixth avenue, New York, has opened a heating, plumbing and gasfitting shop.

F. R. LAVERTY, 39 Beekman street, New York, has opened a steam and hot water heating business and will also do plumbing.

KEYSTONE PLUMBING & STEAM HEATING CO., Ambridge, Pa., have bought out the branch shop of Henry Horton, Monessen.

WM. J. McGUIRE, Mamaroneck, N. Y., has opened a heating and plumbing shop.

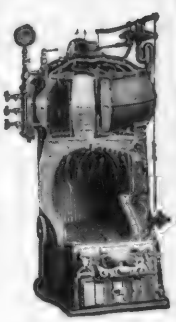
BALTIMORE SANITARY PLUMBING & HEATING CO., 164 E. Saratoga street, Baltimore, Md., is a new firm.



WALKER BOILERS

GOOD BOILERS THAT'S ENOUGH

WALKER & PRATT MANUFACTURING COMPANY BOSTON, MASS.



SHAFER & PRICE succeed Guy Price, Mt. Carmel, Ill.

HERBERT E. BENNETT succeeds Frederick S. Billings, 41 Washington street, Boston.

HARRY F. MELLON, Sixth and West streets, Wilmington, Del., has opened a heating and plumbing shop.

SANDMEYER & DICKSON CO., Peoria, Ill., succeed the H. Sandmeyer Co. and the Dickson Heating & Ventilating Co. Their specialty will be the Dickson patent system for heating and ventilating buildings by indirect steam and natural ventilation.

BAY CITY PLUMBING & HEATING CO., 721 N. Water street, Bay City, Mich., is a new concern: F. Johnson, vice-president and manager; secretary, John O'Brien.

FREEPORT PLUMBING & HEATING CO., Freeport, Ill., incorporates with capital stock of $5,000. Incorporators are Geo. J. Dehn, Wm. Bues, and Wm. H. Fox.

CHARLES H. NORTON, 123 Fourth street, New Bedford, Mass., has a steam and hot water heating shop.

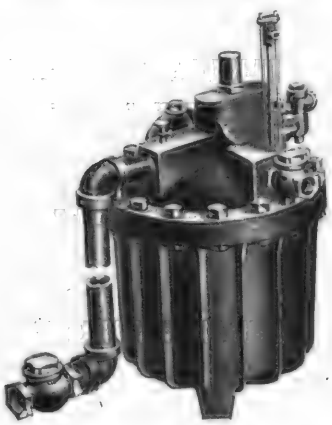
REEVES FOUNDRY CO., Trenton, N. J., has been incorporated with a capital of $60,000. Incorporators, Clifton Reeves, Chas. M. Heath and W. A. Holcomb.

GLOBE FOUNDRY CO., Portchester, N. Y., has been incorporated with a capital of $40,000. Directors are, Henry D. Merchant, New York, and John C. Merchant, Nassau.

MASSACHUSETTS FUEL SAVING RADIATOR CO. has been incorporated at Foxboro, Mass., by E. B. Swift, John Weber and David Weber, with a capital stock of $15,000.

A. A. GRIFFING IRON CO., Jersey City, N. J., distribute a folder descriptive of the Bundy steam specialties, including steam traps, steam and oil separators, etc.

ORR PAINTER & CO., READING STOVE WORKS, Reading, Pa., issue a 76 page catalogue descriptive of their Sunshine hot water and steam heaters, together with much valuable practical information, including illustrations of various piping systems, coil connections, etc.



The Albany Return Steam Traps

have been the **STANDARD** for over **THIRTY-TWO YEARS.** For returning water under pressure to the boiler, they will perform this duty fully as well, and in many cases better than the so-called steam loop.

Send for circulars A, B, C and D.

MANUFACTURED BY

ALBANY STEAM TRAP CO., ALBANY, N.Y.

FREDERICK TOWNSEND, PRESIDENT — JAMES H. BLESSING, GEN. MGR.

KENT'S ENGINEER'S POCKET BOOK

A REFERENCE BOOK OF RULES, TABLES, DATA AND FORMULAS FOR THE USE OF ENGINEERS, MECHANICS AND STUDENTS

The Standard Book of Reference. 1100 Pages

Price $5.00

HEATING AND VENTILATING MAGAZINE

1123 Broadway, New York

WEBSTER FEED WATER HEATER and chemical purifier has its cardinal points set forth in a little booklet issued by the manufacturers, Warren Webster & Co., Camden, N. J. On the front cover is the illustration of a little compass, the north star of which seems to be the heater, the southern cross the purifier, while the sun rises from the receiver and sets over the filter.

The booklet contains a good little essay on scale in boilers, the trouble it causes and methods of avoiding it and getting rid of it. An important feature of the Webster system of purification is the use of heat, as no treatment by cold air could accomplish the same results. The flow of the chemicals is automatically regulated, as is also the fresh-air supply.

HEALTHFUL SCHOOLS, and what engineers can do for them, are well described and beautifully illustrated in a new book sent us from England with the compliments of D. M. Nesbit, M.I.Mech.E.

It is a good exposition of the merits of the right kind of ventilation.

AIR COMPRESSORS in a great variety of styles are described in bulletin C 201 of the Clayton Air Compressor Works, 114-18 Liberty street, New York. The catalogue is fully illustrated by handsome half-tone engravings.

THE COLONIAL MODEL HOUSE won for the American Radiator Co., the grand prize at the World's Fair, in St. Louis. We have previously referred to this model house, which was designed as a means of education to home lovers and a tribute to American domestic architecture.

A wall hanger showing the "Colonial Model House," handsomely done in colors, is distributed by the American Radiator Co., and constitutes an excellent wall decoration for steamfitters and an aid to them in securing contracts for high-grade heating work.

A MODEL ORDER BLANK is one of the latest pieces of advertising of the Model Heating Co., Philadelphia. It provides for a complete list and specifications of steam or hot water boiler, radiators, of the size, height, kind and tapping, all kinds of fittings, valves, plates, hangers, etc. In sending this to the trade, the Model Heating Co. state that it is a general form which can be used for any boiler and will facilitate placing orders for material. It is urged upon the steamfitter that he lay out his plans and take off his list of materials as soon as possible after the contract has been signed in order to avoid errors. The specification can then be laid away until such time as it may be required.

"Sunrays" are pleasant in Winter

Why not use Sunrays in your business?

We will make it pleasant and profitable for you to use them.

The J. L. Mott Iron Works

84-90 Beekman St., New York

HART & CROUSE CO., Utica, N. Y., and 235 Water street, New York, send us two calendars for 1905.

One is a small desk calendar. The large wall calendar is on dark, rough-surface, embossed board, and shows a pretty little landscape done in colors and a condensed advertisement in gold of the Royal heaters.

PIERCE, BUTLER & PIERCE CO. send us their new boiler and radiator catalogue, which is a very fine specimen of advertising work. There are 118 large pages, mostly devoted to half-tone engravings. The frontispiece shows the western front of the works at Eastwood Heights, Syracuse, N. Y. The other engravings represent the eight steam boilers, ten hot water boilers, two tank heaters and four patterns of radiators manufactured by this important company, whose first boilers were completed in 1881. From 1882 to 1888 they were also heating contractors and they state that the work which was done during this period constituted the greater part of the work done in that line in the United States.

The company also send us a little brochure, the front showing a farm scene by the light of the harvest moon. A conspicuous feature everywhere is the Pierce crest, and the title page reads, "The Pierce Crest Represents the Highest Type of Boilers, Radiators and Plumbing Supplies."

The subject of the book is "Common Sense Heating," and it is designed to attract the house owner, interest him in the high-grade goods made by the Pierce company and aid the steamfitter in securing contracts.

Copies of both these books should be asked for by those of the trade who have not received them.

There is also a "Pierce Plumbers' Hand Book," containing 104 pages, which is of undoubted value to plumbers.

AMERICAN VENTILATOR CO., 15 Cortlandt street, New York, send us a handsome catalogue of their ventilating apparatus. Their works are at Cold Springs, N. Y., and they manufacture under the patterns of Joseph Leather, whose devices have been in use in England for many years. Copies of the catalogue will be sent on application.

"SMOOTH ON CASTINGS" is an iron cement for effectively stopping cracks or blow holes, and otherwise repairing iron castings, which is described in a new catalogue of the Smooth-On Manufacturing Co., 572 Communipaw avenue, Jersey City, who make similar cements for various purposes.

THE ÆOLIPYLE

When applied to the Smoke Collar of a Furnace

SAVES Time, Labor, Coal.

PREVENTS Escape of Coal Gas.

GIVES Additional Heat and an even Temperature night and day.

Recommended by Furnace men. Specified by Architects. Adopted by the United States Government.

In use by thousands of individuals, as well as Railroads and School Boards.

Send for illustrated Booklet and Trade Discounts.

ÆOLIPYLE CO., 237 Water St., NEW YORK.

RADIATORS of the Triton and Chautauqua pattern are the subject of the latest piece of advertising matter of the manufacturers, U. S. Radiator Co., Dunkirk, N. Y.

U. S. HEATER CO., Detroit, send with their mail a small circular, illustrating the '98 series, heavy duty, Capitol boiler, explaining the advantages of this excellent construction.

WESTINGHOUSE TYPE S. MOTORS for direct current circuits are set forth in a little booklet of the Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

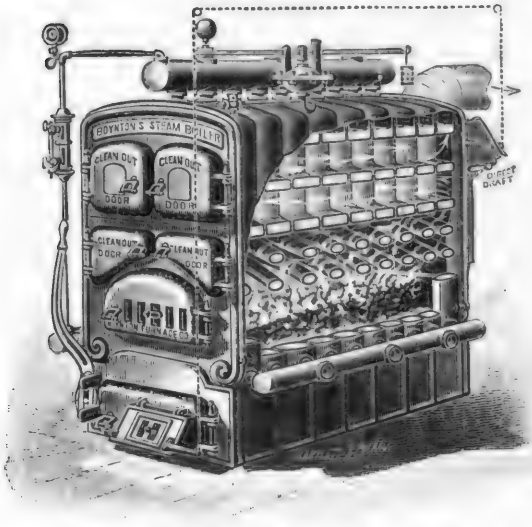
Most heating engineers have occasion at one time or another to provide a motor for fans or for some other purpose, and the Westinghouse motor is well worth investigation.
B. C.

DEANE STEAM PUMP COMPANY, of Holyoke, Mass., distribute a new catalogue on condensers, No. D-23. This publication reviews the principles and advantages of the several types of condensers as applied to steam engines, including surface and jet condensers, and discusses vacuum pumps, exhausters, air and circulating pumps, and other auxiliaries. A recent development, which is treated of quite fully, is the provision of proper condensing arrangements for steam turbines. Unlike the reciprocating engine, the turbine can expand its steam to the extreme limit of the exhaust pressure, and every inch of vacuum above 26 inches increases the economy by from thre to five per cent. It is, therefore, advantageous to use the most perfect type of condensing equipment for this service, which has led to the production of improved types of independent air and hot-well pumps, separate circulating pumps, air coolers, etc. Everyone having to do with steam power plants will find this book of value.

PIERCE, BUTLER & PIERCE MFG. CO., Syracuse, N. Y., are erecting a new addition to their machine shop, 150 by 250 feet. They are also adding to their storage facilities by a building 100 by 125 feet. These enlargements have been necessitated by the recent rush of business and the prospective business of the future.

SHIRLEY RADIATOR & FOUNDRY CO., Shirley, Ind., advise us that they have just let the contract for a new warehouse, 75x125 feet, which is their warehouse No. 3. They state that they have been able at all times to make prompt shipments and that they have been more than pleased with the volume of their business this year, which they say doubled that of last year, necessitating the increase of their capacity for next year.

The Boynton Steam Boilers and Hot Water Heaters



Manufactured in 84 Sizes suitable for any requirements.

Adapted for Hard or Soft Coal, Wood or Natural Gas.

WRITE FOR CATALOGUE

The BOYNTON FURNACE COMPANY

207 and 209 Water Street NEW YORK
10 Post Office Square BOSTON
147 and 149 Lake Street CHICAGO

POWERS REGULATOR CO., Chicago and New York, always have reason to be proud of their results, and now they feel that they have a new cause for pride.

The new Chicago Orchestra Hall, just opened in Chicago, is equipped with a very elaborate system of heating and ventilation.

No one thing is more responsible for the remarkably comfortable and healthful conditions prevailing in this hall than the fact that it is furnished throughout with the Powers System of Heat Regulation by which the temperature is automatically controlled. The Powers apparatus is particularly adapted to the control of large ventilating systems.

CRANE CO., Chicago, notify us of the apopintment of H. L. Haldeman to the management of the San Francisco branch in place of H. T. Lally who lately resigned. Mr. Haldeman was known to the trade for many years previous to his connection with the Crane Co., for whom he has lately been managing the country sales department.

SMITH & ANTHONY CO., Boston, manufacturers of the well-known "Hub" heaters, had a threatening little fire December 14, but it was extinguished with a loss of only a few hundred dollars.

AMERICAN RADIATOR CO., whose New York office was the pioneer in the uptown movement, shortly make another important move. They have secured the premises, 104-108 W. 42d street, first and second floors and basement. The first floor will be occupied as a general salesroom, giving them adequate space for a fine display, while the second floor will be devoted to offices. During the past season in particular, they have been seriously handicapped by badly cramped accommodations, and will soon enjoy the luxury of ample space, enabling them to do comfortably what they have so well done at a disadvantage—satisfy their trade.

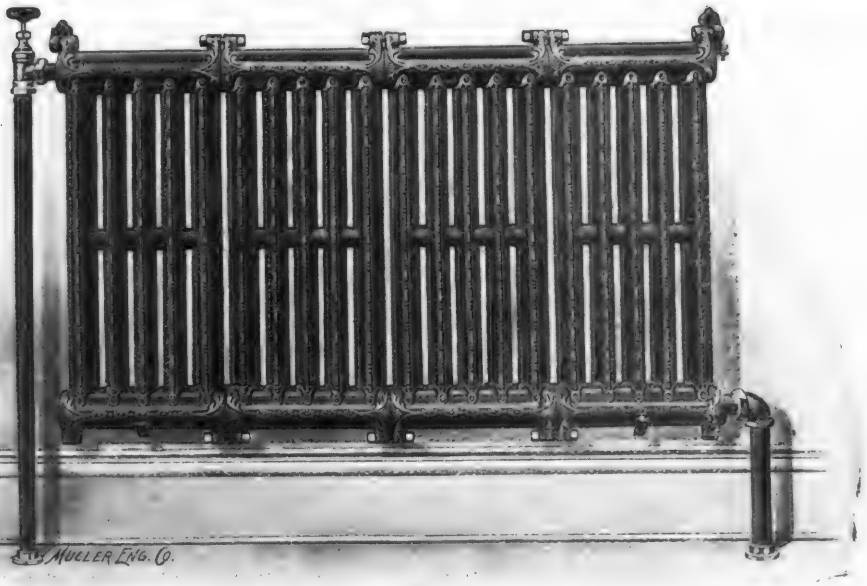
KELLOGG - McCRUM - HOWELL CO., New York, will add to their Norwich plant a three-story building 75 feet square for the storage of patterns. The space now used for storing patterns will be used for storing radiators and for machinery for assembling radiators.

At the other end of their property they will erect a 75 by 350 foot warehouse three stories high.

PITTSBURG VALVE & FITTING CO., Barberton, Ohio, are preparing to double the capacity of their plant, in accordance with the demand for their excellent goods.

"Novus" Wall Radiator

PATENTED



Slip Nipple Connections Consequent freedom from leaks when many sections are combined in one radiator. Easily assembled without special tools. **Artistic in Appearance**

National Radiator Company, Johnstown, Penn.

AMERICAN STEAM GAUGE & VALVE CO., Boston, will close their Philadelphia office January 1. The territory which has previously been covered by the Philadelphia office will be covered by the New York office.

CRANE CO., Chicago, are erecting a five-story building for their general offices at the corner of South Canal street and Twelfth Place. It is expected to be completed by March 1.

JOHN A. RATHBONE, superintendent of the U. S. Heater Co., Detroit, will leave that company January 1 and thereafter will be connected with the International Heater Co., Utica, N. Y. Mr. Rathbone has been with the U. S. Heater Co. for about ten years, all but the first few months of which were spent in the manufacturing department.

MARTIN CAR HEATING CO., Dunkirk N. Y., contains among its new board of officers the following names well known to the heating trade: F. W. Smith president; C. W. Marsh, vice-president and general manager; R. J. Gross, chairman of the board of directors.

W. H. H. ROBERTS, general superintendent Powers Regulator Co., New York, was recently married to Miss Emily Gertrude Howe, Utica, N. Y.

CATALOGUES AND PRICES of heating and plumbing goods are wanted by C. S. Mobley & Bro., Frederick, Md.

J. D. HIBBARD, President John Davis Co., Chicago, will read a paper at the annual meeting of the American Economic Association, in Pittsburg, on the subject of the Open Shop. By business experience and special study, Mr. Hibbard is eminently qualified to discuss economic questions.

C. L. SLOTBOOM, of W. Slotboom & Son, The Hague, Holland, is spending a few months in this country with a view to acquiring an intimate knowledge of our methods of heating and ventilating.

JOHN CUMMINGS, formerly treasurer and general manager of the Ohio Pump & Brass Co., has undertaken the general management of the sales department of the Shirley Radiator & Foundry Co., Indianapolis, Ind. Mr. Cummings has a large acquaintance with the jobbing houses through whom the Shirley Company handle their output.

Heating Contracts

IOWA MANUFACTURING CO., Oskaloosa, Iowa, heating post office at Kirksville, Mo.

Thatcher Comfort Steam and Hot Water Heaters

Look at the interior construction of the Dome.

You can see at a glance how the products of combustion are retarded until all the heat units have been extracted.

This not only means fuel economy, but what is as important, the Dome makes a perfect super-heater, and nothing but absolutely dry steam is delivered to the radiation.

A Steam Heater, Range or Furnace that bears the "*Thatcher*" name-plate will bring sales and pleased customers to any fitter who handles them.

Thatcher Furnace Company

Works: Newark, N. J. **240 Water Street, New York**

AMERICAN BLOWER CO., Detroit, furnishing heating and ventilating apparatus for the following factories: A. L. Ide & Sons, Springfield, Mass.; L. Schreiber & Sons Co., Cincinnati, Ohio; Coulter & Lowry, Greensboro, N. C.; Chattanooga (Tenn.) Plow Co.; Drew-Selby Co., Portsmouth, Ohio; Dean Electric Co., Elyria, Ohio; Benedict & Burnham Mfg. Co., Durham, Conn.; Ingram-Richardson Mfg. Co., Beaver Falls, Pa.; A. Burdsal Co., Indianapolis, Ind.; Mershon, Schuette & Parker, Saginaw, Mich.; Sheffield Car Co., Three Rivers, Mich.; Wickham Piano Plate Co., Springfield, Ohio; Bullock Electric Co., Cincinnati, Ohio; Kelly Springfield Road Roller Co., Springfield, Ohio.

PETER CUNNEEN, New Rochelle, N. Y., heating and plumbing new building at Larchmont.

EMPIRE HEATING CO., 4177 Third avenue, New York, heating two seven-story loft buildings on Twenty-first street.

JOHN A. SCOLLAY, 74 Myrtle avenue, Brooklyn, heating new Schellenberg building on Myrtle avenue.

LOUIS WANNER, JR., 33 S. Seventeenth street, Philadelphia, Pa., heating and ventilating Hanscom's restaurant at 1311 Market street.

A. N. PERRY, North Attleboro, Mass., heating and plumbing residence of G. H. French.

R. J. WHITE, 10 Mulberry street, Lynn, Mass., heating and plumbing new residence of Martin L. Dodge.

ANDREW H. BROWN, 1777 Broadway, New York, heating and plumbing new mansion at Tarrytown, N. Y.

BUILDERS' HEATING CO., W. Thirtieth street, New York, heating an apartment house on Washington avenue.

HANSEN & CO., Suffren, N. Y., heating residence of J. D. Aken, Sloatesburg, N. Y.

WILLIAM F. WILSON CO., San Francisco, Cal., heating and ventilating four-story hospital building on Julian avenue.

A. J. SMITH & CO., Los Angeles, Cal., heating Ocean Park bath house, Ocean Park, Cal.

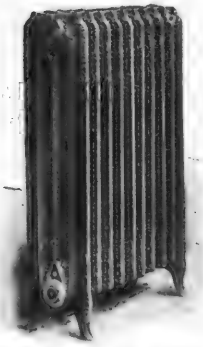
GEORGE E. BEERS, Suffren, N. Y., heating store of Samuel Levin.

McCOY & OTTE, Peekskill, N. Y., heating Franklin School.

BROECKEL & CO., Union Park, Mass., heating office building of Harvard College Corporation, Cambridge, Mass.

The New York Radiator

The Latest and Most Improved Construction



New York Three Column.

FULL EFFICIENT SURFACE

ARTISTIC DESIGN

ALL HEIGHTS

New York Radiator Company

79 Lake Street
CHICAGO

783 Lafayette Street
UTICA, N. Y.

233 Water Street
NEW YORK

A. Y. McDONALD & MORRISON CO., Dubuque, Ia., heating new infirmary for the State Hospital at Mendota, Wis.

CHANDLEY BROS., Beaver Falls, Pa., heating and plumbing plant of Becker Bros.

IOWA MFG. CO., Oskaloosa, Iowa, heating new post office at Kirksville, Mo.

MOLINE HEATING & CONSTRUCTION CO., Moline, Ill., heating Swedish Lutheran Church.

JONES & KOEHNLE, Lincoln, Ill., heating new Broadway theater.

JAMES O. HERN, Hannibal, Mo., heating St. Joseph Convent.

A. T. WARD, Athol, Mass., heating and plumbing Roman Catholic Church on School street.

KRIEBEL & CO., 821 Spring Garden avenue, Philadelphia, heating Protestant Episcopal Church, Pine and Darien streets.

BLAKE & WILLIAMS, New York, heating and ventilating new college building on Washington Heights.

BLAKE & WILLIAMS, New York, heating public school in West New York, N. J.

M. J. McLAUGHLIN, 2077 Seventh avenue, New York, heating several suburban houses near Mount Vernon.

J. C. DANKELMAN, JR., Chester, Pa., heating Dr. O. Bryant's residence.

CONSOLIDATED ENGINEERING CO., Chicago, heating shops of the Atchison, Topeka & Santa Fe Railroad, at Newton, Kas., and Lajunta, Colo.

McDONALD BROS., Detroit, Mich., heating Cadillac Automobile Company's plant.

SHAFER & PRICE, Mount Carmel, Ill., heating new Lutheran Church.

COLUMBUS HEATING AND VENTILATING CO., Lancaster, Ohio, heating new high school.

JEFFERSON HEATING CO., Jefferson City, Mo., heating new high school.

FOSTER HEATING CO., 15 Palmer street, Roxbury, Mass., heating new gymnasium on Columbus avenue playground.

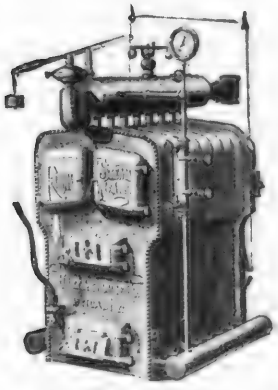
INGALLS & HENDRICKEN, Boston, Mass., heating new residence at 21-31 West street.

WALWORTH CONSTRUCTION CO., Pearl & High streets, Boston, Mass., heating new building at Fort Banks, Winthrop.

A. E. VESPER CO., Los Angeles, Cal., heating new house in that city.

JOHN L. FOX & CO., 112 Clark street, Chicago, Ill., heating Baraga school, Marquette, Mich.

ROYAL HEATERS



LARGEST AND MOST SUCCESSFUL LINE OF HEATING APPARATUS IN AMERICA

Hot Water and Steam Heaters, Combination Heaters, Hot Air Furnaces

HART & CROUSE COMPANY

78 La Fayette Street, UTICA, N. Y.

COLUMBUS, OHIO **CHICAGO, ILL., 79 Lake St.** **NEW YORK, 235 Water St.**

BRITISH STEAM SPECIALTIES, Ltd., Fleet Street, Leicester, England.
MAGUIRE & GATCHELL, Ltd., Dublin, Ireland.

CLEVELAND STEAM FITTING & SUPPLY CO., 1804 Hamilton street, Cleveland, O., heating and ventilating Presbyterian Church, Scranton avenue.

W. H. WEEKS, Wasonville, Cal., heating and ventilating Monterey county court house.

E. P. NAY & CO., Los Angeles, Cal., heating building at the Legg Central Track.

STORMS & CO., Newark, N. J., heating and plumbing new court house.

HERSH & BROTHER, Allentown, Pa., heating city schools.

CLARENCE S. KNIGHT, Monroe, N. Y., heating Silver Fox Inn, Turners, N. Y.

C. W. McNALLY, Milwaukee, Wis., heating and ventilating school building on Fifth avenue.

G. A. SWALM & SON, Middletown, N. Y., heating and plumbing depot for the New York, Ontario and Western Railroad.

HALLETT & BEHRENS, Suffren, N. Y., heating and plumbing new residence of T. F. Keane.

SMITH & STREBEL, Munroe, N. Y., heating and plumbing residence for F. P. Earle.

EDWARD FLANAGAN & CO., Kensington and Lehigh avenues, Philadelphia, heating residence for D. M. Barr.

AMERICAN HEATING & VENTILATING CO., Harrisburg, Pa., heating new Technical High School.

JOS. DOWD, Cincinnati, Ohio, heating home, Little Sisters of the Poor, Florence avenue, also Catholic Seminary, at Cedar Point, Ohio.

W. G. REID & SON, Rochester, N. Y., heating and plumbing Geo. Eastman's residence, East avenue.

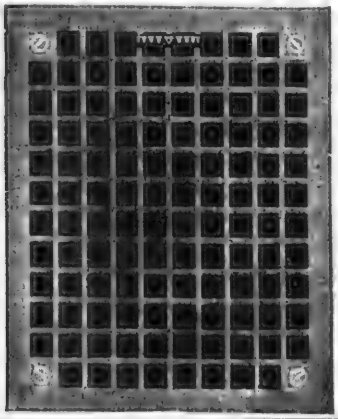
NEW YORK PLUMBING CO., Des Moines, Ia., heating Dodge Light Guards Armory.

COLUMBUS HEATING & VENTILATING CO., Columbus, Ohio, heating high school, Lancaster, Ohio.

JEFFERSON HEATING CO., Jefferson City, Mo., heating new high school.

GRANT, JENKINS & CO., 1219 Arch street, Philadelphia, Pa., heating and plumbing residence of William Klein, Elkins, Pa.

DWYER HEATING & PLUMBING CO., 30 East Sixth street, St. Paul, Minn., heating, plumbing, boiler equipment and water supply in National Home, Hot Springs, S. D.



Kernan Registers

ALL SIZES AND FINISHES
WE CAN SAVE YOU MONEY

Syracuse Stove Works,
SYRACUSE, N. Y.

Telephone, 383 John.

NEW YORK BRANCH,
231 Water St.

ELMO AIR VALVES

AUTOMATIC FLOAT

LOCK SHIELD AUTOMATIC FLOAT

First class, high grade goods. Close by flotation and expansion. Many special features of excellence which will be readily appreciated : : :

PHELPS BROTHERS
210 Water Street New York

JOSEPH F. CURRAN, Swarthmore, Pa., heating and plumbing new parochial residence for the R. C. Church of Nativity, Media, Pa.

J. J. JOYCE, Ritzville, Wash., heating new school buildings.

NEWWELL BROS., Los Angeles, Cal., heating and plumbing city hall.

CAMPBELL-LAIRD HEATING CO., Minneapolis, Minn., heating residence, 3009 University avenue.

A. LEVY, 18 E. 110th street, New York, heating and plumbing apartment house on 116th street.

W. B. WARNOCK, Beaver, Pa., heating Commercial Hotel, Sharpsburg, Pa.

J. G. HALLINAN, Fifty-second and Vine streets, Philadelphia, heating and plumbing Samuel Shoemaker's office building.

JAMES P. WOOD CO., 39 S. Fourth street, Philadelphia, heating Hamilton Disston mansion, which is being converted into an apartment house.

POWERS REGULATOR CO., New York, furnishing heat control for new school at Summit, N. J.

POWERS REGULATOR CO., New York, furnishing heat regulation for the large Hippodrome, Sixth avenue, Forty-third to Forty-fourth streets, New York.

B. McKENZIE, Greensboro, N. C., heating new five-story City National Bank.

W. G. MORRIS, Phœbus, Va., heating new officers' quarters, Fortress Monroe, Va.

ERIE HEATING CO., Chicago, Ill., heating roundhouse of Boston & Albany R. R., Allston, Mass.

EMPIRE HEATING CO., 4177 Third avenue, New York, heating Masonic Temple, Washington street and Tremont avenue.

EMPIRE HEATING CO., 4177 Third avenue, New York, heating St. Mary's Catholic Club, 151st street near Courtland avenue.

CHARLES MATHERS, Jenkintown, Pa., heating and plumbing residence at Abbington.

WILLIAM DORAN, Frankford avenue, Philadelphia, heating Oxford Mills, Hancock and Oxford streets.

A. J. SMITH & CO., Los Angeles, Cal., heating, lighting and plumbing bath house, Santa Monica, Cal.

E. P. NAY & CO., Los Angeles, Cal., heating three-story building.

CARTHY & DUMBECK, Salt Lake City, Utah, heating and plumbing forts Douglas and Duschene.

Hub Heating Apparatus

SUPERIOR IN DESIGN, CONSTRUCTION AND EFFICIENCY

HUB STEAM HEATER

HUB HOT WATER STOVE

HUB FURNACE

Manufactured and Warranted by

SMITH & ANTHONY COMPANY, BOSTON

L. F. BANNON, Hasbrouck avenue, Kingston, N. Y., heating and plumbing Allaben Hotel, Margaretville, N. Y.

WAGLER BROS., Pekin, Ill., heating residence of G. G. Dodds and of H. Bowman.

OTTO ROSENFELD, Manistee, Mich., heating Guardian Angel Parish house.

MAGEE FURNACE CO., Union street, Boston, Mass., heating residence of Louis Brugwire, Newport, R. I.

FRED DOLD, JR., 138 S. Main street, Port Chester, N. Y., heating and plumbing residence of Chester Baker, Greenwich, Conn.

WILLIAM DORAN, 3429 Frankfort avenue, Philadelphia, heating and plumbing new residence on Frankfort avenue.

A. BODE & SON, 1526 Germantown avenue, Philadelphia, Pa., heating building at Fifth and Thompson streets.

JAMES BROS., West Chester, Pa., heating and plumbing Nurses' Home.

BOWERS BROS. & CO., Real Estate Building, Philadelphia, Pa., heating Wayfarers' Lodge, on North Marshall street.

JOHN BORDEN & BRO., Fairmont avenue and Nineteenth street, Philadelphia, Pa., heating Church of the Resurrection.

HOFT & SNELLAR, Passyunk Road, Philadelphia, Pa., heating residence of Mary DuRoss on Passyunk avenue.

CLEVELAND STEAM FITTING & SUPPLY CO., 1082 Hamilton street, Cleveland, Ohio, heating residence of J. W. Flint, East Cleveland.

JOHN BATY, Dover, N. H., heating and plumbing Carnegie Library.

PUEBLO ELECTRIC CO., Pueblo, Col., heating county poor house.

ROSE & CHILDS, Ellenville, N. Y., heating residence of G. H. Dutcher.

F. C. CLEGG, Memphis, Tenn., heating Deaf and Dumb Institute, Jackson, Miss.

Hot Water Circulation

ILLUSTRATED

Fifty blue prints bound, showing range boiler connections and hot water circulation under all possible conditions; full notes and practical suggestions; the result of 35 years' experience. - - - - - - - **Price, $3.00**

MODERN PLUMBING STEAM AND HOT-WATER HEATING

By JAMES J. LAWLER

Over three hundred diagrams and illustrations showing the various systems of heating and ventilating by steam or hot water.

Six Folding Inserts showing Waste-pipe System of Plumbing, One-pipe Systems of Steam and Hot-water Heating, Overhead System, Fan System of Heating and Ventilation, and Steam and Hot-water Circuits. 400 Pages, Large Octavo Size, 10 x 7½ inches, Bound in Extra Cloth. Price, $5.00, prepaid in the United States. Postage added for Foreign Countries.

HEATING & VENTILATING MAGAZINE, 1123 Broadway, NEW YORK

H. SWEENEY & CO., Seattle, Wash., heating and plumbing new Northern Pacific building.

GREEN & REEVE, Salt Lake City, Utah, heating and plumbing new Bingham schoolhouse.

SAMUEL ESSWEIN, Columbus, Ohio, heating new schoolhouse at Wapakonta, Ohio.

W. H. DRAYER PLUMBING CO., Middletown, Ohio, heating and plumbing new dormitory of the Uniana University, Oxford, Ohio.

BENJAMIN COHN, 1353 Fifth avenue, New York, plumbing, heating and gas fitting three apartment houses which are being overhauled at 142d street and Seventh avenue.

WESLEY LYNES, Johnstown, N. Y., heating and plumbing residences in Johnstown.

C. DWYER, Amsterdam, N. Y., heating and plumbing Warner House.

JAMES BROTHERS, West Chester, Pa., heating and plumbing residences on John Wyeth estate.

TAYLOR BROTHERS, Darby, Pa., heating apartment house, Thirty-seventh and Chestnut streets.

SHAW & FOWDEN, Chester, Pa., heating public school No. 13, Chester.

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